International Edition

July 1984 Issue #286
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73 T.M.

Amateur Radio's Technical Journal

A CWC/I Publication

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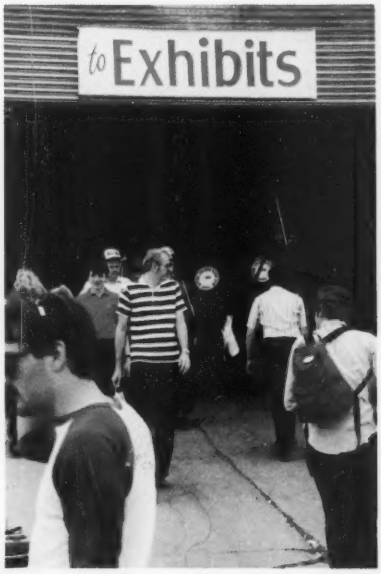

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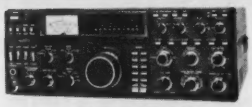

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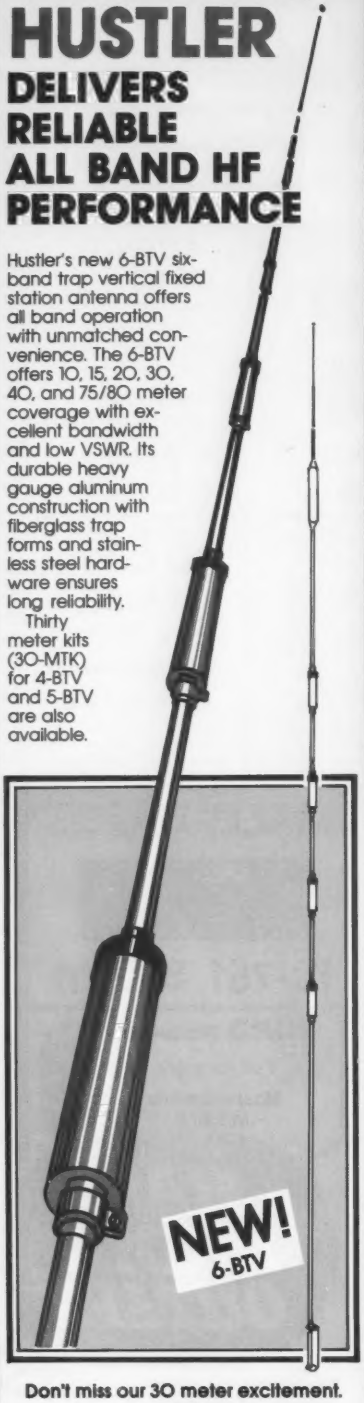

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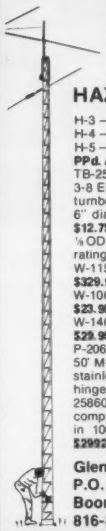

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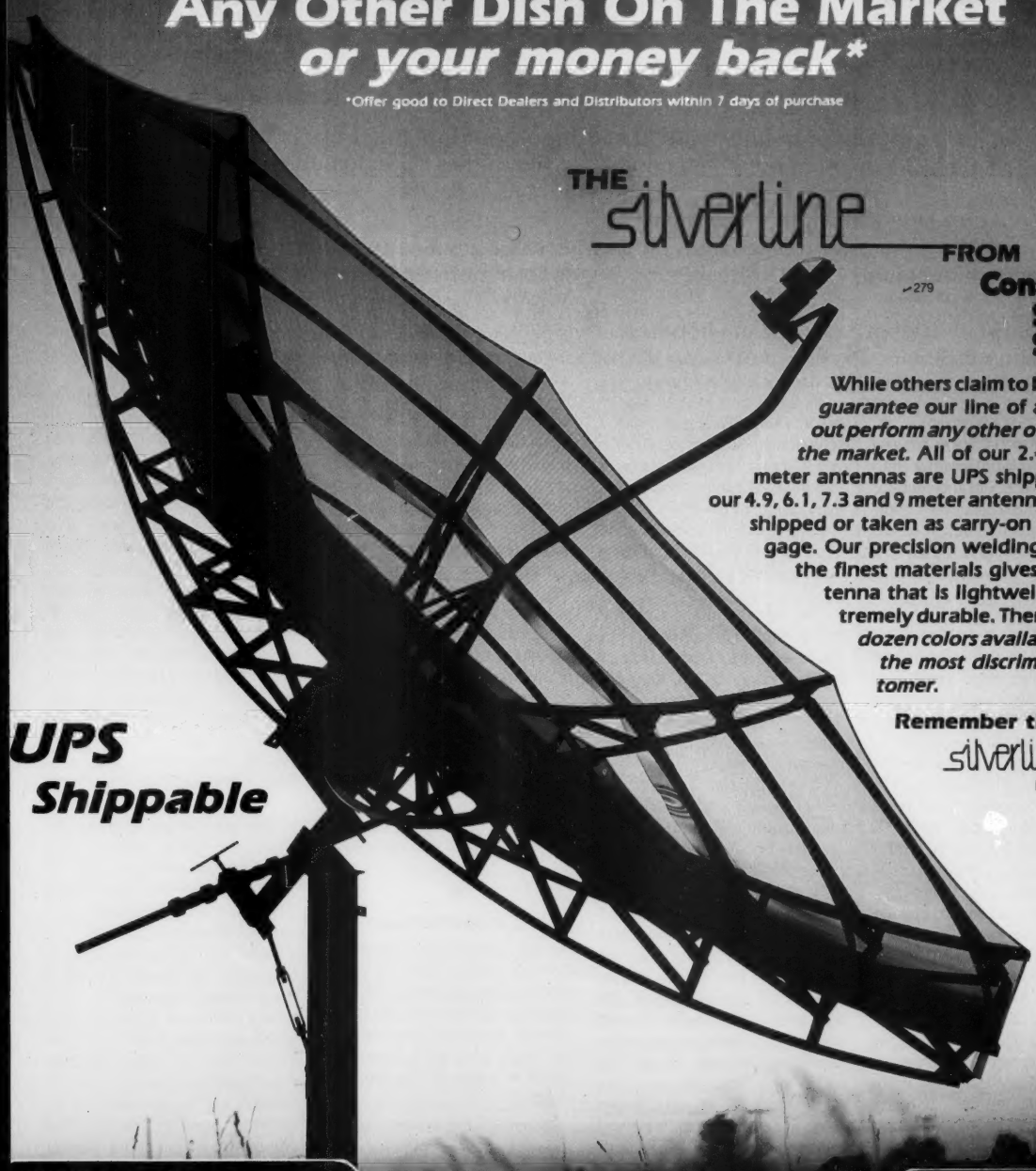

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W2NSD/1
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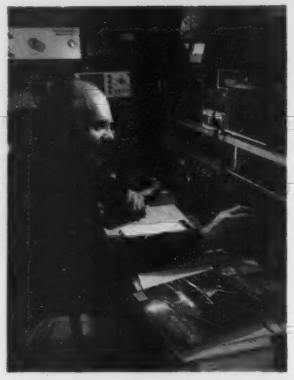
editorial by Wayne Green



THE HAMVENTION

Dayton was as big as ever—or bigger. Hara Arena was pretty full on Friday, packed on Saturday, and pretty full on Sunday with hams not just from the midwest, but from all over the world. There was even a ZS contingent from South Africa wondering when I was going to get back down to visit them again.

A handful of old-timers groused about my 35-wpm petition, but 99% got the point and enjoyed it. Some *73* readers were suckered in by media reports and did Archie Bunkers. (See my talk.)

A few years ago, I got to talking on Friday—mostly because the meeting rooms they had available then were so noisy on Saturday as to be almost impossible. They've built some new (quiet) meeting rooms, so I hope to be invited to do a Saturday talk next year.

Yes, I enjoy the acclaim I get—It helps a lot when I get to feeling discouraged. I get more pleasure than I can describe when I meet people at shows who tell me that my talks or editorials inspired them to change.

If you haven't been making the yearly pilgrimage to Dayton, maybe 1985 is the year to get off your duff. These DARA fanatics have their Hamvention worked out in every detail (and I emphasize the word *work*). Zillions of prizes, all reported on computer monitors. Somehow, they manage to guide the cars bringing over 20,000 hams into neighboring fields. They even have the incredible flea market well organized. It goes on for acres—the biggest one I've ever seen. I spent a couple hours walking around it this year and didn't even cover half of it. You wouldn't believe the amount of stuff there! You can find any model rig or receiver ever made, any test equipment, any radio part, any tube, transistor, IC, wire of any kind, coax, connectors, and so on. It's all there at prices that are hard to pass up.

If you want weather stations, laboratory clocks, muffin fans, relay racks, hi-fi, lo-fi, an old Emerson radio, Teletype®, relays, telephones, slow-scan, RTTY—you name it and it's there on hundreds of tables. There were even some EE8A WWII surplus telephones and some Gonset Communicators. I thought those had reached their final resting ground long ago.

The temperature went from the 40s the day before up into the 80s for the hamfest, forcing me to gr vel at the Kenwood booth for a hat to keep what's left of my brains from frying while I was doing the flea market.

At the *73* booth, I shook a lot of hands, got my ego properly rebuilt, and met an enormous number of old friends. Larry Horne N2NY was there. He used to work for me almost 30 years ago. He's worked out some really fast Morse-code teaching techniques and has been reputed to get newcomers started at 50 wpm and copying in one weekend. Why spend months starting at 5 wpm and gradually relearning the code all the way up, driving yourself and your family crazy, when you can just as easily start out at 50 wpm? I dunno if these people can copy 5 wpm or not...probably not. Probably not even 13 per, but at 50...no strain.

If you're going to make it to Dayton next year, be sure to drop me a QSL card and let me know what subjects you'd like me to talk about. For that matter, if there's something you think I should cover in an editorial, hey, this is a two-way street.

Some ham dropped by the booth and beefed to Jim Gray W1XU that Wayne has his editorial and that the readers have no way to be heard. Jim asked him if he'd written a letter to the editor. Grumble, no. So write one, said Jim. A couple minutes later, the same chap started loudly with the same theme, more interested in generating a fuss than in accuracy. Letters with anything worthy of being printed will be printed. General beefs or emotional harangues probably won't make it—unless our Executive or Managing Editor wants to expose the vacuity of thought which characterizes some letters.

On the whole, I'm awfully proud of *73* readers. You are, with very few exceptions, intelligent and perceptive people. I don't write for 12-year-olds. I write for intelligent hams and most readers respect this. The 12-year-olds, of all ages, can have problems understanding me.

THE DAYTON TALK

[At 2:00 pm on April 27, Hara's Room 2 hosted W2NSD's yearly report on where amateur radio is today and where it could be tomorrow. And what to do about it. We hope you enjoy this transcript of some of his remarks. —JCB.]

Good afternoon. I'm Wayne Green W2NSD. And I understand that you read my editorials but don't agree with them 100 percent. [Loud guffaws. —Ed.]

So on that basis...had a number of questions asked me since I've been here. And I'll try to address most of those, if I can. If I forget some of them, make a note and ask me later, and I'll try to cover whatever I've forgotten about. But, in general, I cheat on my talks. I don't plan much ahead. And I figure either I'll think of what I was supposed to talk about or you'll remind me.

Now, since my talk last year, we've had a few minor changes in my organization. And those of you who read the magazine are aware that basically I sold all of the Wayne Green, Incorporated, magazines to another company, IDG, International Data Group, who publishes *Computerworld* and about 50 magazines in 18 countries. It makes it very handy for travel—there is always a company office there.

I got a good deal out of it, as you may have read. And people keep wanting to know, "What are you going to do with the 60 mill?" [Guffaws.]

Well, I'll tell you. I'm going to try to put it to the best use I can and do my very best to make an awful lot of people very wealthy. It's an old story that you can't take it with you. And indeed, the agreement I made was that whatever's left over when I leave goes back to the company.

Now, all of the reasons that I made that arrangement—one of the reasons that I made the deal with IDG—is that they were aiming in the same direction that I was. It was my intention to take Wayne Green, Incorporated, and eventually have the employees own it. IDG is doing the same thing. And indeed they have turned a substantial percentage of the corporation over to the employees' fund already. And the schedule eventually will be 100 percent of it. ["Superham" Don Wallace W6AM enters room and sits down in front row.]

With the bo-nanza, I have formed a new company called Wayne Green Enterprises. And I have a number of projects in the works with that. And I'll tell you about some of those because they have a lot to do with my background in amateur radio. (Hi, Don, good to see you. Delighted that you could come.) And I think that I have some plans that may eventually help amateur radio a lot.

We're starting out, essentially, with a new publishing organization. And in order to get the people to do this, I'm starting a

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More information on the TR-7950/7930 is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

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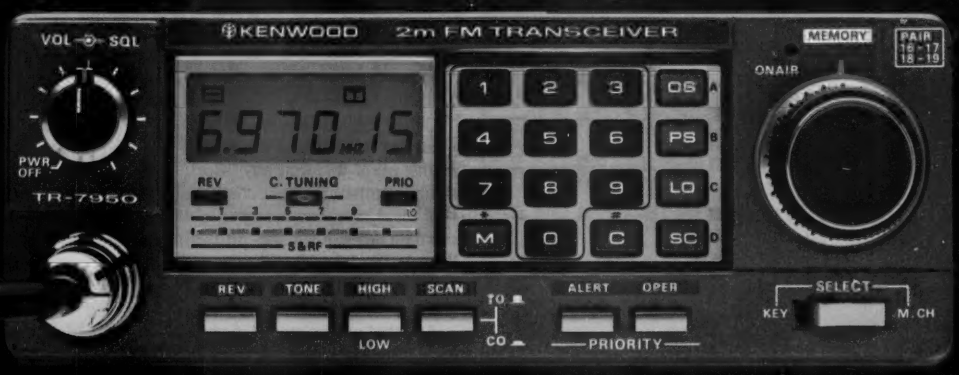


publishing school. And we have about 10 magazines lined up to get started with the people that we train in this school. And, of course, the people who do well in school we'll put on the new publications. The people who do poorly, we'll sell to our competitors. [Chuckles.]

The new magazine, the first one, will be *Digital Audio*. And how many of you are not familiar with digital audio in the compact disc? Are any of you out of communication with the world? [Chuckles.] OK. Well, perhaps you remember the 78-rpm record. And then there came along a newfangled contraption called a long-playing record which within a few years put the 78-rpm record out of business.

Well, there is a new technology called digital audio which is going to put the LP out of business in a very few years. And the new record is the compact disc which is about yea big. And it is written on and read by laser. And it is so phenomenally better than LP records that you have to hear it but once to be addicted to this new sound. For the first time, when you listen to hi-fi, you can hear the sound of silence. And for you technical people, you have the potential with this new recording medium of a 95-decibel range of sound (where on an ordinary record about the best that they can do is around 60 dB). So it's thousands of times better. Well, we're going to try to help this industry, this brand new industry, to grow with a magazine.

The second magazine will be in the telecommunications field and this will be for businessmen so that they will be able to cope with these new telephones and new types of communications that are on the market. Right now, I know of no magazine out there for businessmen to tell them what these things do.

We have two or three computer magazines in the works. And one would think that with 300 magazines on the market that there would be enough, but there still is a need for a few more that other people have not yet perceived. And we will be proceeding with that.

Now, perhaps even more important, once we have gotten things running fairly smoothly with these relatively easy magazines, we have two huge ones in the works. And when I say huge, I mean circulation on the order of 10 to 20 million. What I intend to do is take the 60 million [dollars] and within four years build that up to one billion. And I think we're going to be able to do it. And I believe that every person that works for us is going to be, at the minimum, a millionaire. My calculations are that within four years they should be worth approximately 1.6 million each. Because we're putting aside part of the stock and the people who work for us have a share in the company.

The big magazine—and the one that is going to be the most important to amateur radio—will have to do with teenagers. And basically, we want to start a magazine which is an instruction book for growing up. And you can bet that it is going to be very heavily laced with high tech. It'll encourage kids to be interested in amateur-radio communications, to be interested in computers.

I think all of you are well aware of what's happened in computers. How many of you here have Model 100s already? One, two, three, four, five, not bad, six, seven, right. A year from now, I suspect there will be at least ten times that many in the audience that have briefcase portable computers. But these computers are just part of it. It's what these are going to force to happen that is important. And that is the key for anyone who would really like to make money, because these small computers are going to require communications.

Right now, you can plug this [holds up Model 100] into the telephone and you can communicate through hundreds, any of hundreds, of bulletin boards, communications services, and so forth. The next step—and it's something that we could do with amateur radio *right now*, if we wanted, with our current technology—any one of you could probably do this if you'd sit down and do it. And that is put a small relay transmitter in here, probably 149 Megahertz, and make it so if you use this within the room with a small room repeater, it would pick up the information from that so you don't have to plug it in anymore. And you could hook that onto the telephone. That's the first step.

The next step is to have an area repeater so that the room repeater goes to your area repeater. Any of your regular repeaters that you have today could do this. Have the area repeater, say, every five minutes, or every three minutes, or every minute, send a pulse out with a coding for your particular computer and it says essentially, "Are you turned on? Do you have any traffic?" And your computer, if you have it turned on, will say, "Yes, I'm turned on, I have no traffic," every so often. It will take a few milliseconds to do it.

Once you *have* written the message to someone *anywhere in the world* and you say "Go," the next time you are polled by that local repeater through your room repeater, it will say, "Yes, I have traffic." And it will dump it *with error-correcting* at *25,000 words a minute*.

And that will be stored in your local repeater, which will then look up to see where-in-the-devil this thing is going and route it either to another repeater or to a local recipient or perhaps by a satellite link to somebody down in Ceylon [Sri Lanka] who was sitting on the beach with another system. Or to his home repeater waiting for when he comes home and turns on his unit and it finally says, "Yes, I'm here, is there any traffic?"

We can do that with the technology we have today. Nobody has to invent a *thing*. We just have to *do* it.

If you do it, you know as well as I do that there is no power on Earth going to stop that from selling. It is a service that is needed desperately. And some bright person somewhere is going to do that and going to become incredibly wealthy and you're going to say, "Gee whiz, look at that, how did he do that, wasn't he lucky?" I find that the harder I work, the luckier I get.

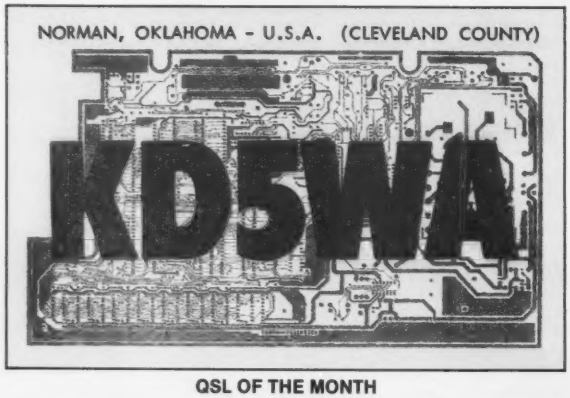
So these things are there. We are going to need communications in 10 years that are on the order of a thousand times—maybe ten thousand times—what we have today. And that means that we are going to need ten thousand times as many engineers and technicians as we have today.

Now, I'm sure that most of you are aware that the growth of amateur radio last year was two and a half percent. And that this year we're looking for a net loss. Unless something changes radically. I'm sure you're *also* aware that the growth of amateur radio in Japan last year was 25 percent and has averaged, over the last 20 years, over 300 percent a year. It slowed down a little bit in the last few years. We have averaged for the last 20 years a growth of 2 percent. Average. Two point zero percent in the United States.

I wrote in *73*—a couple of years ago—an editorial, and I said I bet you it isn't going to be long before our military are sending electronic development contracts to Japan. And I got the biggest bunch of hee-haws from the readers. And they said, "Boy, are you crazy." Big headlines about four months ago: The military tried to get electronic contracts with Japan for military equipment development and they turned us down.

I'd like to do something about that. I'd like to reach teenagers and interest them in amateur radio. In the United States, we

Continued on page 76



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Perry Donham KK2Y
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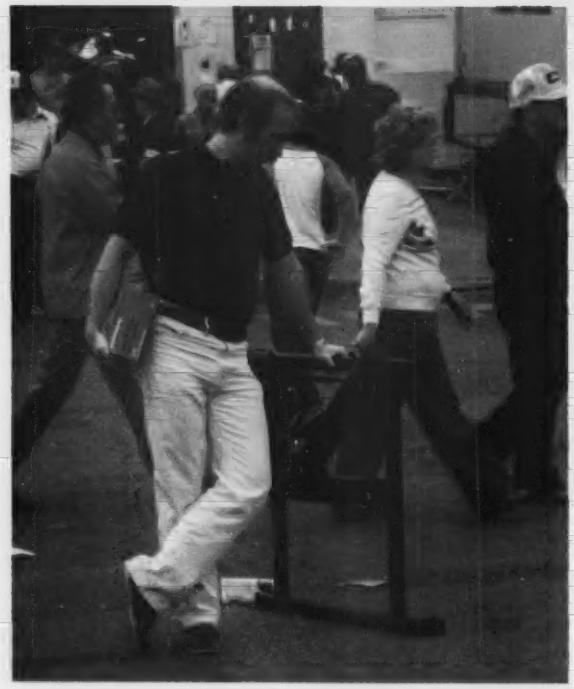
Shoot at Will

KK2Y's Dayton mandate was to capture things on film. He did it. Enjoy a slice of Hamvention.



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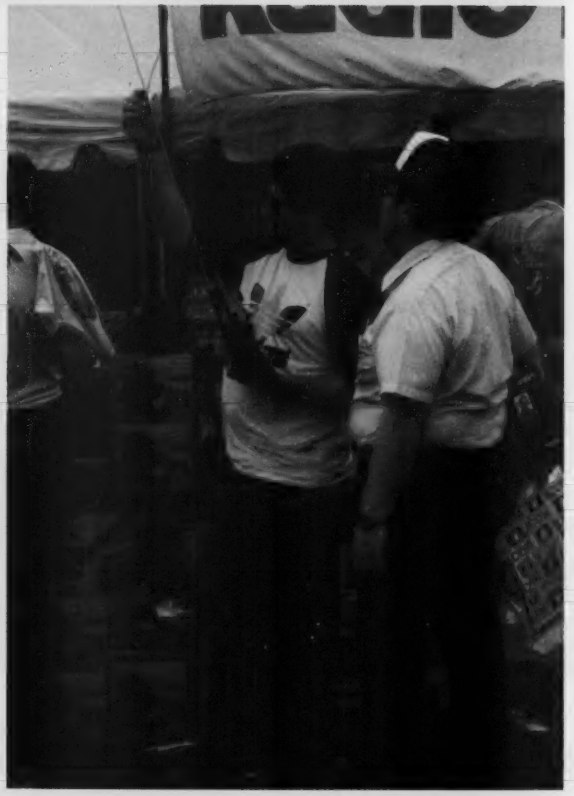
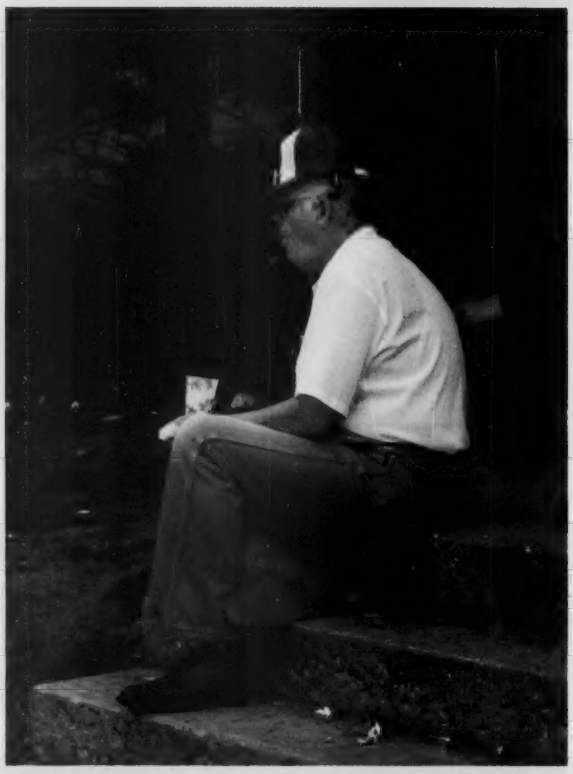
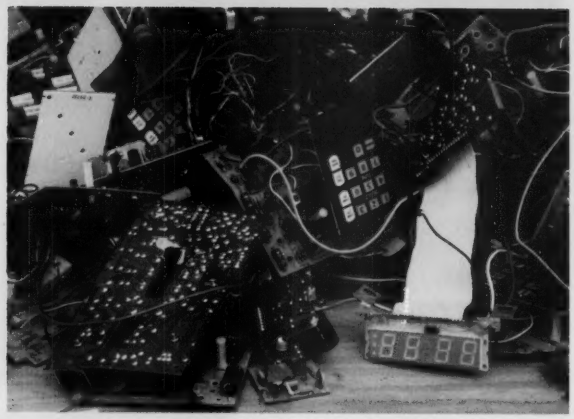
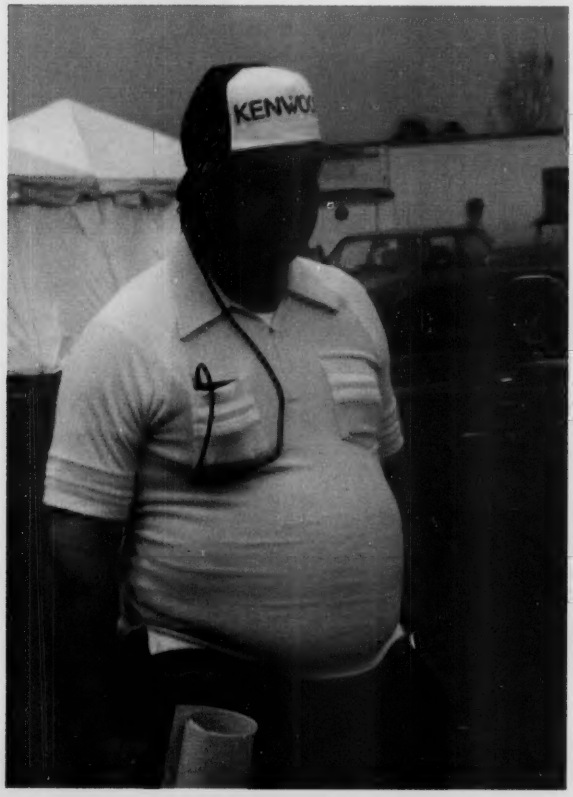




DARA boys (L–R) Terry Falkner N8EEO, Joe Moore K8VAZ, Jim Orihood WD8JCI.

Jack Mitchell AA8Q, General Chairman, with W2NSD.

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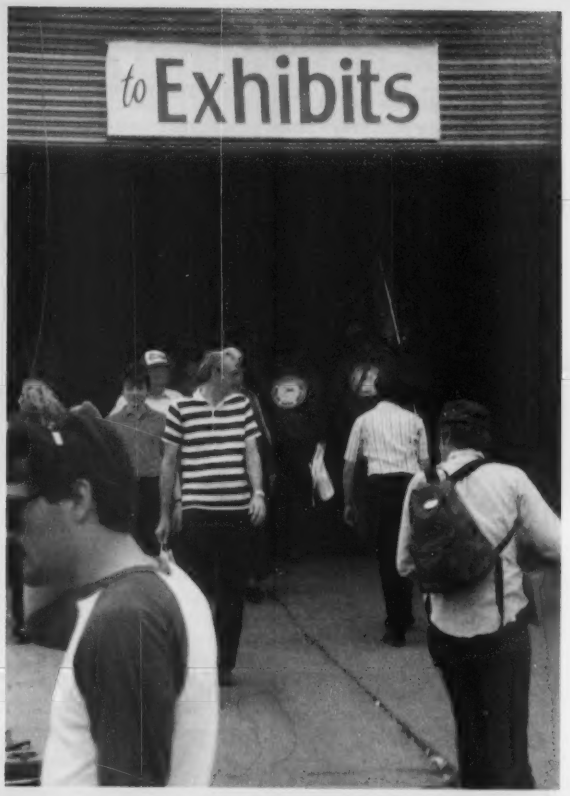

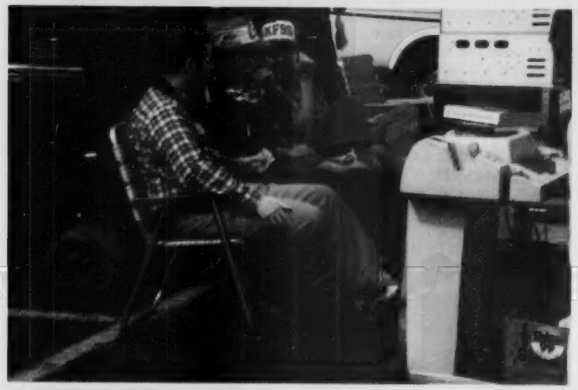

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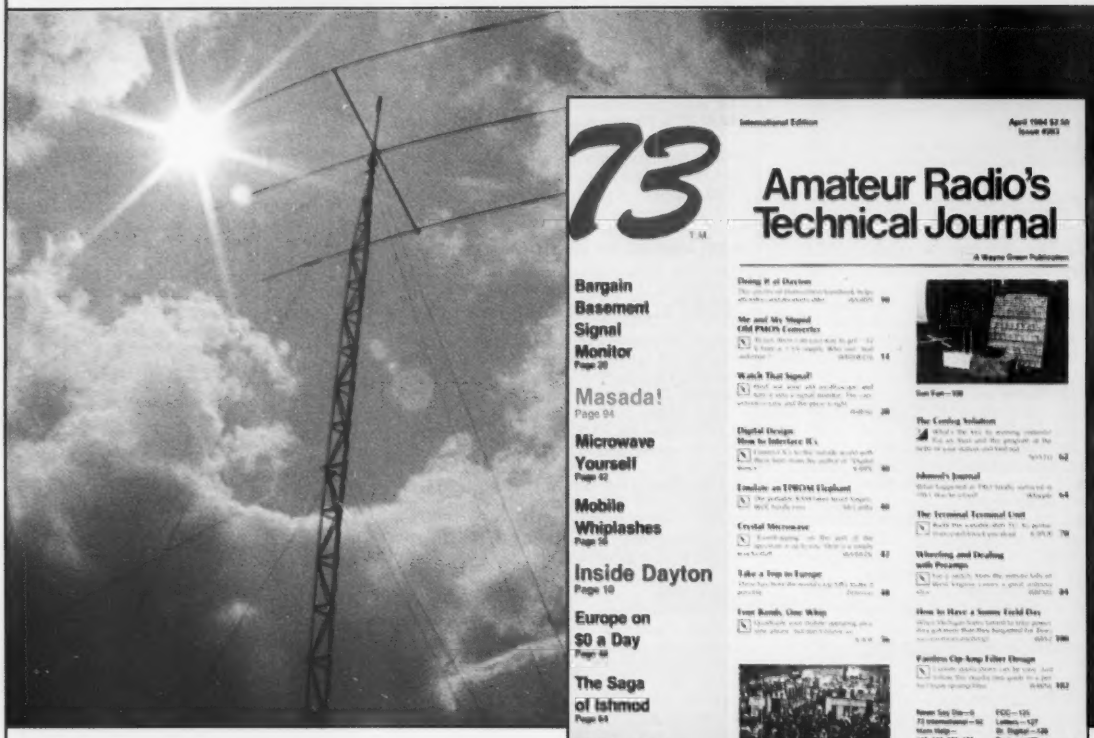

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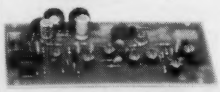

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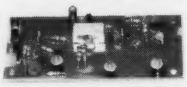

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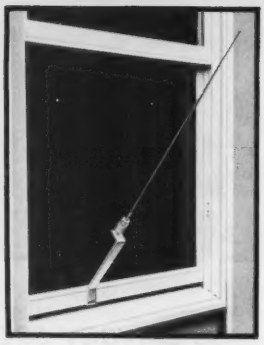

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Secrets of Cordless Phones

Is privacy sacred and range not?
Maybe some hands-on research can help you decide.

I purchased a wireless telephone some time ago. Being curious about electronic gadgets, I did some hands-on research by examining the electronic innards and came up with a few mods and suggestions to make it even more useful. Wireless phones employ full-duplex operation and consist of two parts. The hand-held unit transmits on 49 MHz and is crystal-controlled. The base unit transmits on about 1700 kHz but uses an LC circuit. Its frequency can be adjusted by a tuned slug. Both operate in the FM mode. There are several ways to increase the phone's range and still preserve your privacy and avoid interference.

First of all, if you are considering the purchase of a wireless phone and you already own a programmable police scanner, enter in the following frequencies: 49.830, 49.845, 49.860, 49.875, and 49.890 MHz. Scan these five channels for a few days to get an idea which frequencies are most populated in your neighborhood. Using a Bearcat 250 with an outdoor antenna, I was able to get clear reception for over one-half mile. You may hear a juicy thing or two because people just don't realize others can listen in. For this reason, avoid initiating credit-card calls over a wireless phone. Remember, you'll only hear one side of the conversation—the hand-held unit's side. The other side of the phone conversation is carried on 1695, 1725, or 1755 kHz, although there are a few newer designs which duplex both sides of the conversation in the 49-MHz band.

The 49-MHz frequencies are designated as channel numbers or letters. For example, 49.830 is channel 1 or A, 49.845 is channel 2 or B, and so on. The wireless phones are usually marked on the outside of the box they are packed in which channel they operate on. In my neck of the woods 49.845 MHz seemed to have the least amount of traffic so I purchased a unit marked "channel 2." It's a good idea to avoid channel 3 or C (49.860). All the new unlicensed kid handie-talkies operate on this frequency these days, and even though they are AM, you will still receive some interference. If you don't have a scanner to check out the neighborhood frequency usage, you'll have to take pot luck. Just avoid channel 3 or C. If you purchase a wireless phone by mail, state which channel you wish. You may not get what you want but it's worth a try.

In case you want or need to change frequency on your wireless phone, here's some general information. The transmitting crystal in my hand-held is marked 16.615 MHz but is actually a third-overtone, 49.845-MHz crystal. Crystals can be ordered from Jan Crystals, PO Box 06017, Fort Myers FL 33906-6017. Be sure to tell them the name brand and model of your particular phone. It also would be a good idea to send along the original crystals to ensure that the new ones will be ground to the correct electrical characteristics.

The 49-MHz receiver at the base is a slightly differ-

Amplifier speaker, hand-held unit, and base unit.

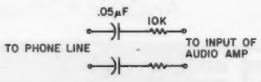
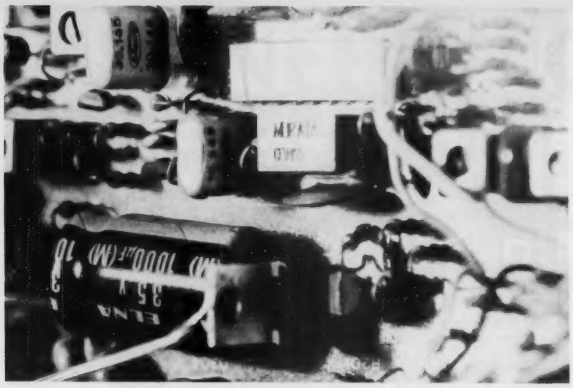
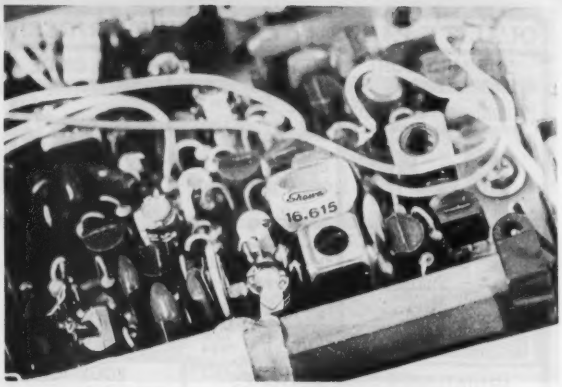


Fig. 1.



Close-up of 49-MHz base-unit receiver crystals. The 39.145 crystal is socketed and can be changed easily.



16.615-MHz crystal in hand-held unit is actually a 48.845-MHz, third-overtone unit.

ent story. To receive 49.845 MHz, my unit uses a master crystal oscillator on 10.245 MHz to clack against a socketed 39.145-MHz crystal. This adds up to 49.390 MHz which is exactly 455 kHz (the i-f amp frequency) below 49.845 MHz. Other units may vary.

For the most privacy, you could change your wireless phone to operate on a frequency a smidgeon above or below the five designated 49-MHz channels and never have to worry about someone else with a similar unit making phone calls (either inadvertently or on purpose) through your base unit. However, to keep inside the law, it would probably be better to shift it to a frequency actually "between" the 15-kHz-spaced channels, keeping in mind to stay away from the vicinity of 49.860 MHz. A shift of 5 kHz is enough to keep you safe from similar units.

My hand-held had a crystal-controlled, 1700-kHz receiver. The HC32 crystal was 2.150 MHz which is 455 kHz above the 1695-kHz base-transmitter frequency. The base-transmitter frequency can easily be changed by adjusting a slug-tuned coil so you'll only need to change the receive crystal in the hand-held unit. Shifting the low-frequency link will also give you more privacy and less interference.

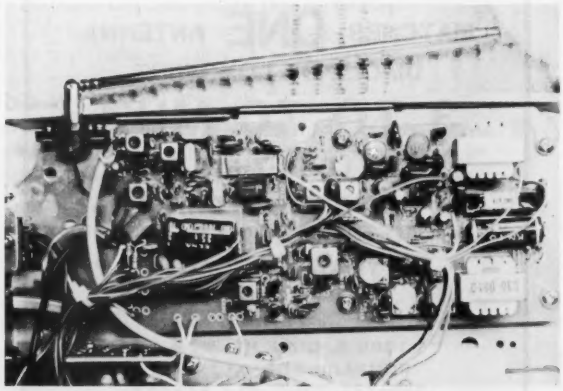
Now take a look at the power cord coming out of your base unit. One side of the zip cord is marked with a white line, small lettering, or a groove running the length of it. This is the "antenna" side of the 1700-kHz base transmitter. Keep this side plugged into the "hot" terminal of the electrical outlet for better phone range. In my case, it added about 100 feet of extra range.

Conversely, to increase the range of the 49-MHz base receiver, it can be connected to an outdoor antenna. I used a quarter-wave CB ground plane with half the radiator removed. A six-meter antenna would work fine and so would an allband scanner antenna, although these are more costly. You can use a clip lead connected between the base unit's telescoping antenna and the center of the external antenna's coax or open the base unit and solder a short length of shielded cable to the PC board and terminate it with the proper in-line female connector. Using an external antenna is all the more reason to shift the 49-MHz link to prevent unauthorized use of your phone line through the base unit.

By the way, you can listen to the 1700-kHz side of the conversation on most broadcast-band AM radios if they have a bit of over-tuning on the high end of the dial. I've monitored my own base unit on two different hi-fi receivers successfully and have heard a couple of other neighborhood phones as well. You can hear both sides of the phone conversation on these frequencies. Just remember, the signals are FM so you'll have to use slope detection by tuning a bit to either side of the FM carrier.

I turned my base unit into a 49-MHz receiver by soldering a cable to the circuit board and running it to the input of an Archer 277-1008 amplifier sold by Radio Shack. There are four terminals on the circuit board connecting to the phone lines. To find the correct two terminals, first disconnect the base unit from the phone lines. Put the hand-held on "talk" so it is transmitting on 49 MHz. Using two clip leads, experimentally hook up two terminals at a time to the input of any audio amplifier until you get a loud squeal from the feedback between the hand-held and the audio amplifier. Once you've found the correct terminals, install the circuit in Fig. 1 between the base unit and audio amplifier. This prevents any loading on the phone line when you plug the base unit back in. It also allows you to listen in on any phone call using the audio amplifier. Now when you have the base unit on but disconnected from the phone line, it is a 49-MHz receiver for one of the five channels.

I also tapped into the base unit's regulated power supply to power the audio amplifier. It provides about



PC board in base unit. The 1700-kHz transmitter frequency can be varied by a slug-tuned coil.

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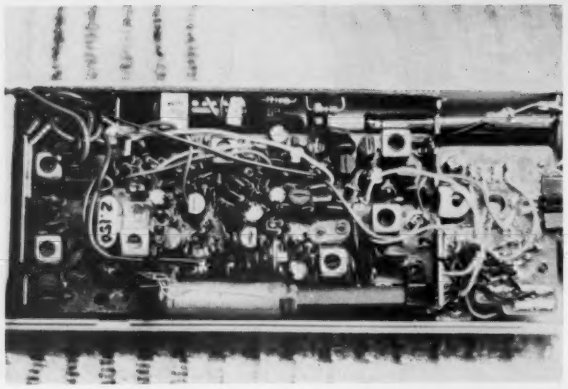

PC board in hand-held unit. On the left of the board is the 1700-kHz receiver crystal, marked 2.150 MHz. In the middle is the 49-MHz crystal socket.

10 volts. The collector of the regulator power transistor (the "tab") and one side of the filter capacitor provide the power. Use a voltmeter to find the correct polarity. I added a jack to the amplifier speaker's battery terminals for quick connecting to the base's power supply. There's not much to it.

The wireless phones are quite nice to have when you aren't near a "real" phone. The only other suggestion to purposely curtail reception by others on the 49-MHz end is to keep the telescoping antenna on the hand-held extended just enough for clear communications—usually, you won't need to extend it at all when you use the unit in the house. ■

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Modern-Eyes the S-Meter

Here's how to de-strain your baby blues by adding a simple LED readout.

Gordon W. Patterson
12-4215 Meadowvale Drive
Niagara Falls, Ontario
Canada L2E 5W8

Photos by Tish Cox

Having recently acquired a Realistic Patrolman 6 salvaged from the neighborhood garbage can, I decided that some form of indication was needed when I was tuned to the local repeater, VE3NRS. The only thing missing from the receiver was a band-selector shaft. This was easy enough to fix, and the receiver works great! I also use the receiver to listen to a local net which meets on 144.6 AM every Sunday night at 0230.

Various magazines were searched for an S-meter circuit; those found were unappealing. Then one day I stumbled across an LM3914 IC and my troubles were over. The LM3914 chip is a monolithic IC which senses analog voltage levels and drives up to ten LEDs, providing a linear analog display. This IC requires no resistors between the IC and the display, as the current drive to the display (LEDs) is regulated and programmable. The display can be used as either a bar or dot array. Another option of the LM3914 is operation from as little as 3 volts to a maximum of 18 volts. The IC can drive LEDs of many colors.

Theory of Operation

In operation, the device senses changes in the voltage applied to its input. The unit I built has an input range from 0.13 to 1.3 volts. So with each increase of .13 volts, the IC will turn on an LED in sequence.

Referring to Fig. 1, R1 controls the current going to the LEDs. With a value of 1000 Ohms, current through R1 will be 1/10 LED current, which gives a value of about 10 mA for LED current.

Take a look at Fig. 2. This is the internal operation of the LM3914. The 1.2 reference voltage is used for comparison of the voltage which is applied to the input. With each increase of .13 volts of the input signal, a resulting comparator will turn on and produce an output at pin 1 and pins 10 to 18 which will drive an LED. The LM3914 could be replaced with a handful of LM339s, but it would seem senseless since cost would rise and there would be more work required in constructing the circuit. Also, more discrete components would be needed.

In Fig. 1, you will notice that the display can be placed in the bar mode by connecting pin 9 to the Vcc

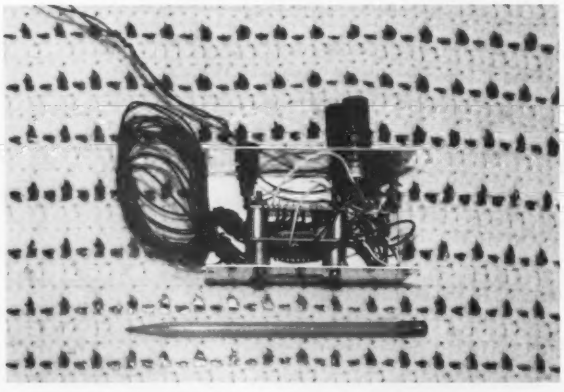

Photo A. The S-meter—inside view.

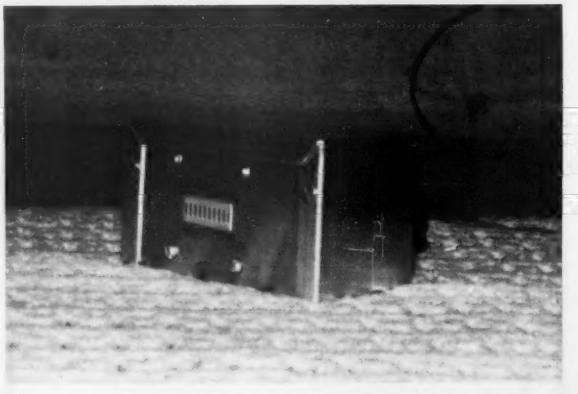

Photo B. The S-meter—outside view.

line, or in the dot mode by connecting pin 9 to pin 11. The 2.2-uF capacitor between pin 2 and the LED anode line is added only if the display flickers during operation.

Construction

The circuit was constructed on a PC board made by Radio Shack. The board was cut in half so that the LM3914 could be mounted behind the LED display using standoffs. The LED display I used was an MV57164 also purchased at the local Radio Shack. If you want to save money, you can use ten individual LEDs. Also, I recommend using DIP sockets for the display and the IC.

The entire project was placed in a 4"×2¼"×2¼" chassis box since there was no room on the front panel of the receiver to mount the display. If you mount the display in a box, you will have to file a rectangular hole to accommodate the display.

I used banana jacks and plugs for the input, bar-dot display, and power connections. I mounted all of the latter on the back of the chassis box, including the calibration pot. However, you can select whatever you think is better. I used ½-inch spacers which brought the display to mesh nicely with the chassis.

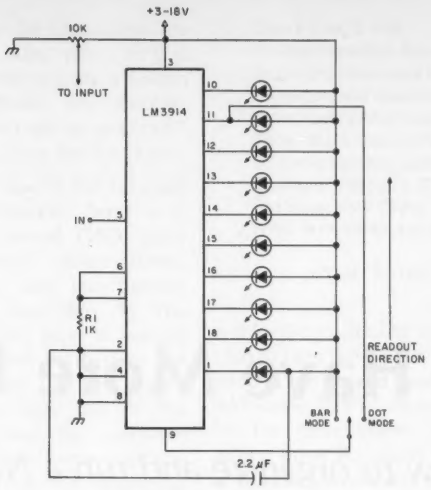

Fig. 1. Schematic.

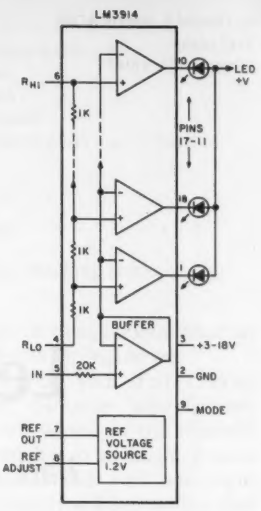

Fig. 2. Circuit of the LM3914.

Hookup

Once the project is finished, the only external connections needed are power and the input connection to the receiver's discriminator circuit. The power can be supplied from the receiver. Once this is accomplished, apply power to the unit. The display will be either on or off.

Now turn the receiver off but keep the supply to the project on. Adjust R2 until the first LED lights, and then back off on the pot until the LED goes off. Now apply power to the receiver and watch the display. Tune around the band a bit to see the reaction of the display. If you can't get the display to light, check to see that you have it in the circuit properly.

Conclusion

I've included a couple of photos of the completed unit so you can see what the device looks like. No longer do I have to tune by ear when I listen to the local repeaters. I'm already in the process of building another "Modern S-Meter" for an old, somewhat tired DX-160.

So heat up them soldering irons! ■

Parts List

Part	Description	Price
IC1	LM3915	$ 5.99
MV57164	LED display	5.99
R1	1k, ½-W resistor	.05
R2	10k pot	1.00
C1	2.2-uF, 25-V electrolytic cap	.50
A1	18-pin DIP socket	1.19
A2	20-pin DIP socket	1.29
PCB	Printed circuit board	2.29
	8 ½-inch spacers, @ .05	.40
	5 banana jacks, @ .35	1.75
	8 nuts/bolts, ⅛ × 2 inch, @ .05	.40
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All of the parts are listed with Canadian price, and can be purchased from Radio Shack.

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Let's Have More Hams

Part I: How to organize and run a Novice class.

Every amateur-radio club attempts, or at least should attempt, a Novice class. Many of these classes wind up in a shambles very soon, however, as attrition reduces them to a small number of hardy hangers-on.

"Oh well," you say, "it's just separating the men from the boys, right?"

Wrong! You are throwing away many potential hams who wanted to get their licenses. They would not have taken the time to show up in the first place if they were not interested. That screening process has already been done for you, so there's no need to do it again.

So, what can be done to better organize and then run a Novice class which has the potential for graduating 100 percent of those who start? Plenty, and most of it has to be done before the first student walks in and stares at an instructor or a chalkboard.

Planning

Planning has to be done well in advance, and several questions have to be answered. What theory and regulations teaching system or syllabus will be used? Which method of teaching the Morse code will be utilized? Where will the class be taught? How often will the classes meet? Who will the instructors be? How will the class be publicized? These are the most important items, and this article will delve into each briefly.

Theory and Regulations

Any attempt to teach radio theory and regulations without an organized syllabus or teaching plan is doomed to disorganization. The plan must cover the entire subject matter and state exactly what must be taught on which day and in what order. Do not delude yourself into thinking that the FCC syllabus is sufficient. A student teacher in college presenting that document to his teaching supervisor would be laughed out into the hallway with detailed instructions about how much more work was required before he should show his face again.

Break down each class session into precise time periods during which certain matters will be taught. Fig. 1 shows a bare outline for one two-hour session.

Each instructor should have an even more detailed guide, showing exactly what will be presented to the students, both orally and visually. Fig. 2 shows a good example of what an instructor's detailed lesson plan might look like for part of the section on Ohm's Law from the basic teaching plan shown in Fig. 1.

Use a chalkboard, overhead projector, slides, demonstrations, or whatever you have available. A visual presentation has far more impact on getting an abstract idea like voltage or current across to a wide-eyed bunch of students who have barely even heard of a resistor, let alone Ohm's Law.

There are several Novice teaching systems available, including those by Radio Shack and Heathkit®. The ARRL "Tune in the World" syllabus is a good, readily available course. It is complete and easy to use as a teaching guide, and it comes complete with a textbook. However, regardless of the syllabus used, be sure it is complete, comprehensive, and presented in a logical sequence. If Extra, Advanced, and old-timer Generals aren't sure if it is a logical sequence, take it down the street to your local junior high school science teacher. Remember, you are teaching people who are not hams and may never have seen a ham radio.

1900–1910	Introductions, names, etc.
1910–1920	Questions and answers
1920–1940	Resistors and capacitors
1940–2000	Ohm's Law, E = IR, P = EI
2000–2010	Break
2010–2030	Morse code practice
2030–2045	Review of Ohm's Law, practical problems
2045–2100	Questions and answers

Fig. 1. Example of a basic teaching plan.

Morse Code

The requirement for learning the Morse code has driven off more potentially outstanding amateur-radio operators than any other barrier. While I am not personally convinced that the code is a valid requirement for a modern ham, it is nonetheless a legal requirement and must be taught. So, why not make it as painless as possible? Do not allow it to screen out scores of new hams before they have had a chance to get started.

After searching the market for Morse-code teaching methods, I have run across two distinct varieties. Both teach the code at five words per minute, initially. However, one teaches each character or letter at 5 wpm (slow style), while the other teaches them at 13 to 16 wpm (fast style). The slow style has characters going by painfully slowly, while the fast style zips them by briskly. The fast style leaves enough time between the characters to give an overall speed of 5 wpm. In my personal experience, there is no question about which is best. The fast style is far superior for learning the characters, and eliminates the necessity of relearning the characters at a higher speed later.

Among the fast styles, there are two subcategories of teaching methods. One of them teaches the letters by groups of dits (E, I, S, H, 5), then dahs (T, M, O, 0), then on to the other letters related in much the same way (ARRL's method). The other starts with A and N, then adds T and E, M and I, and so forth, teaching in groups based more or less on opposites (*73*'s method). I can see merits in both methods and have used them almost interchangeably. The key to the whole thing is teaching the characters at a high speed (13 to 16 wpm), gradually bringing the overall speed up once the characters are learned. Oh, yes . . . if you want them to copy a 5-wpm test without any trouble, teach the code up to about 7 wpm to allow for the jitters.

Now, how to test for code comprehension. Send a 5-minute typical QSO, complete with abbreviations, numbers, and punctuation, and see how they do. You can either give a written test, as does the FCC, or just see if they can get a solid minute's copy out of the whole thing. Be consistent and let them know what you expect from the beginning. You are the one who has to sign on the dotted line and guarantee to the FCC that the individual can communicate in the Morse code at 5 wpm.

One big problem nearly always encountered is a shortage of code-practice oscillators (CPOs). If the student doesn't get one in the first few weeks, he will have a hard time keeping up. The club can help out in several different ways. One is to have all those unused CPOs "donated to the cause" and give them to the prospective Novices. A better way is to have each student build one right away. Take part of the students' registration fee ($5.00 is more than enough) and buy the parts to make a simple oscillator. Club members can make up some PC boards ahead of time and provide the students with a few soldering irons and a couple of helping hands. By the end of the first session, each one will have his/her own private CPO. Another quicker alternative is to buy up a bunch of Radio Shack's code oscillator modules (cat. #20-1155) for about $3.30 each. These modules will require the addition of a speaker, a battery, and a key.

Another inexpensive and easy-to-build code-practice oscillator is shown in Fig. 3. This project should be easily within the capability of the club to help the new student build. One would need to add some sort of mounting for the components, probably a small PC board, wire, a flexible two-strand cable to connect the key, a couple of screws to hold the speaker, as well as any miscellaneous items the builder would want to add. The tone isn't the best, but it is adequate. Probably some variation of the resistors could improve things.

This does not include the key. Radio Shack has a pretty decent one for $5.95. The circuit draws about 30 mA at 9 volts with the key down. A 9-volt battery should provide several hours of code practice. The current could probably be reduced some by substituting a 1-uF capacitor in the speaker lead. (I didn't have one.) The circuit draws no current when the key is open, so there is no need for a power switch.

Ohm's Law, E = IR
E = electromotive force measured in volts
I = current measured in Amperes
R = resistance measured in Ohms
Draw basic circuit diagram on board
Show relationship between variables when one is changed
Do some formula solutions
Example: Voltage = 12 V
Resistance = 2 Ohms
What is current? Answer: 6 Amps

Fig. 2. Sample instructor teaching guide.

Instructors

During my early Naval training at Officer Candidate School in Newport, Rhode Island, I remember one particular leadership lecture. The school had brought in an old captain, whose name I have since forgotten, to talk to us about the mysteries of command and leadership. I remember very little of what he said, except for three rules:

Know your stuff.
Take care of your men.
Be a man.

These three rules, which I am sure he borrowed from someone else, summarize a lot of things about what an instructor should be.

Know your stuff. Choose an instructor who is very well versed in the material which is to be taught. Even a six-year-old will see right through a faker within five minutes.

Take care of your men. The instructor needs to be constantly in touch with how well the students are grasping the subject matter. Be demanding but personable—never be reluctant to drop back and teach it all over again with a smile if it did not work the first time. If at all possible, use a different approach. If they didn't understand, it is quite possible that the technique was faulty or the examples didn't make sense.

Be a man. Do not pretend to be Mr. or Ms. Know-it-all. If you do not know the answer to a question, admit it right off and make a note to bring the answer back next class period. The students will not think any less of you if you do not know one or two things. Also, have the moral conviction to stand up for some standards in what you expect of the students to pass the course. Do not let someone get by with what you know very well to be poor ability in Morse code, just because you are afraid to tell him that he has to work harder or do it again.

Teacher-student ratio. Limit the classes to ten or twelve students for each instructor. By keeping the teacher-student ratio down, each teacher can be personally involved with the students' progress.

Class frequency. In many cases, how often the class can meet will depend on how often the classroom is available. Barring this restriction, however, twice a week is best. Once a week can be made to work, but the time between sessions makes the classes almost unrelated. If classes meet more often than twice a week, students (as well as instructors) will start dropping out from time starvation. Remember, ham radio is *not* the only thing in the world.

Publicity. If no one knows that you are going to have a class, it is hard to gather a crowd. Assign one person (the club's public-relations chairman) to get the word out. Draw up some flyers and get them put up around town. Be sure they get to the junior and senior high schools. If one of the club members works for the local school district, tap him to be the special agent for getting those youngsters notified. They are the best potential hams going because of their unbridled enthusiasm. Most of these kids play around with computers routinely, so electronics is nothing new, and the idea of communicating fascinates them.

Get a spot on the public-service announcements of your local TV and radio stations. Don't just drop off a note and leave; get ahold of news reporters and bend their ears for a while. Tell them they can film the class for a personal-interest story.

Then, don't forget to look for prospective students in your own backyard: wives, husbands, sons, daughters, friends at work, next-door neighbors. All of these people have probably been introduced to ham radio by knowing you. Heck, offer to pay half their registration fee with the other half kicked back if they pass the test. (I hope you're not in this game for the money.)

Miscellaneous Planning Considerations. Choose one individual to be the Novice-training coordinator. Then choose a second person to be the Morse-code instructor. Once this is done, you have gone a long way toward ensuring consistency of instruction. The training coordinator must ensure that continuity is maintained between different instructors. The Morse-code instructor will ensure that the students aren't confused by a myriad of different pet methods of learning code. It's hard enough for the students to learn the code without having to fight their way through several different instructors' ideas about how it ought to be done.

For each student, assign a club member to be his "Elmer." This individual should be present at the first session, and then he should regularly contact the student throughout the progress of the class. This personal touch is essential to maintain interest, especially when initial frustrations are encountered. It also helps when the time comes to set up the first Novice station, or to answer the frantic telephone call at 9:00 pm concerning the unexplained interference to channel 3. *Get your Elmers out*.

The First Class Session

The basic rule for the first class session is to relax the students and introduce them to amateur radio pleasantly. Set up a demonstration of 2m FM, HF CW, and SSB, and throw in some RTTY or ASCII and even some SSTV if it's available. Have the gear set up and tested well in advance with club members planted out in the community for guaranteed contacts.

Make introductions quickly. Pair students off with their Elmers, talk about ham radio a lot, discuss how the course will be run, and build that code-practice oscillator. End it all with the demonstration, letting the students get on the air a bit.

I watched the glazed eyes of several students after they walked out of a first session in which they had been hit with E=IR, P=IE, 468/f(MHz), and a list of the Novice operating frequencies. They had little idea of what they had been given, and they felt they were already in over their heads.

So, bring them in gently, then begin talking about the more substantive material in session number two. By then, they have had a chance to talk to their Elmers, get in a bit of code practice, read the text book, and raise a few good questions. Things will be off to a better start with much less early attrition.

Keeping It All Flowing

Once the initial excitement has died away, it is down to the work of teaching and testing. If you have more than one instructor, the class coordinator must constantly be sure that the teaching is consistent between classes. Keep track of each section's progress. If one student seems to be dropping behind, get the assigned Elmer onto the case right away. The Morse-code instructor should be sure that all practice is done consistently and should check each student every class period. Tests should be available every class session for anyone feeling he is ready. Emphasize the importance of getting that code out of the way first.

Wrapping It All Up

At some point, all the material will have been taught, and everyone will have been given an opportunity to learn the code.

Those who have not passed the code by the end of the program need to have special attention. In most cases, these people are the "Nervous-Nelly" types, who get the jitters each time they take a test, or who have convinced themselves that it is all too hard. With these people you have to pull out all the psychological stops. Be sure these people get with their assigned Elmers. Keep encouraging them. Above all, keep them with other hams and try to maintain their interest.

You will lose some, perhaps, but don't let it happen because you just let them slip away, frustrated. Stay in touch with them, and let them know that it is always possible to try again. It is often easier the second time around.

If you publicize well, and in the right places, the people will respond. Then, by managing the resources available to the local club and by spending a lot of preliminary time in planning and organizing, you can graduate most anyone who sincerely tries. Let's get some more good hams into our community. They are out there just waiting for you to give them a chance. ■

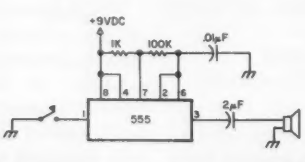

Fig. 3. Inexpensive code-practice oscillator.

CPO Parts List

555 timer	$ .34
1k	.05
100k	.05
.01 uF	.08
2 uF	.13
2" speaker	1.25
9-V battery	1.00
battery lead	.10
case	1.99
	(Radio Shack)
Total	$ 4.99

Thanks to WA0PBQ, my dad, for the circuit design and description.

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Let's Have More Hams

Part II: How to take and pass FCC exams.

Take it from me, upgrading your amateur license is a major task. Think about it. First there's the time spent studying, then there's the trip to the exam point (often far away), and finally there's the exam itself.

I know. I've recently returned from taking the Advanced exam. For me, the entire process was fun because I passed the first time. Unfortunately, for some in the room it wasn't fun. They failed. And for some it was their third time.

Despite all protests otherwise, the real reason applicants fail the exam is inadequate preparation. When you go for the written, you must know the material *thoroughly*.

This is going to be even more important in the future with the recent changes allowing volunteer examiners. You can be sure that the new exams will not be compromised easily. Some book publishers may find themselves out of business. The net result will be an increased emphasis on understanding and a reduced reliance on question memorization.

Surprisingly, most, if not all, study materials overlook one important phase of preparation—that of preparing your test-taking skills. Remember, the FCC determines your qualifications by administering a test. It's unfortunate but true that a person can know the material but still miss questions because of poor test-taking skills. My goal in this article is to improve your skills. A little time spent on brushing up here could make the difference between passing and failing.

The First Mistake

Mistake number one usually comes long before the applicant walks through the examination-room door. Sometime after he begins studying for his first license, the ham-to-be learns that all FCC exams are multiple choice.

A feeling of pleasure and relief overcomes the neophyte. After all, he reasons, what could be easier? The answer's right there in front of me. All I have to do is pick it out.

This attitude toward a multiple-choice-type exam is the first mistake. Actually, a well-written multiple-choice exam is not the gift some think it to be. It can be one of the most difficult exams to bluff your way through. Multiple-choice questions are written to require a sound knowledge of the covered material. Let's look at Fig. 1, which is sample question number one, and use it as an illustration.

In order to answer this question, we have to know Ohm's Law. To get the answer, you must divide the voltage by the amperage. In this case, B is the correct answer: 120Ω.

If you're well grounded in this basic law, it's no problem. But what if you are weak on this point? What if all you could recall was that Ohms, volts, and Amps are interrelated and that you can get one by multiplying or dividing the others... somehow or another. If you multiply volts times Amps, you come up with 4.8Ω. This answer also is listed (C) as a possible choice. No amount of inductive reasoning can help you eliminate a wrong answer like this. You must *know* the material.

The Role of the "Good-Looking" Wrong Answer

FCC exams have often been maligned as being unfair, tricky, or as not really testing your knowledge. Actually, it's not so. The charges stem from the use of the "good-looking wrong answer" in a multiple-choice test. Look back at question one again.

The purpose of this question is to test the applicant's ability to use Ohm's Law to solve basic dc calculations. Therefore, all the answers can be derived by adding, multiplying, or dividing the other numbers in the problem.

In the circuit shown, what is the value of R1?

A) 24.2Ω **C)** 4.8Ω
B) 120Ω **D)** 48Ω

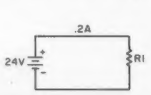

Fig. 1. Sample question one.

How much testing can occur if the wrong answer choices are listed in kHz, pF, or mA instead of Ohms? Very little, of course. If the wrong answer choices are listed in anything but Ohms, the purpose of the question is defeated.

In order to test the applicant's ability effectively, the wrong answer choices must be similar in form and content to the right answer. In the process of keeping the wrong answers from being obvious, the exam writers create the good-looking wrong answer. These answers are designed to be equally as appealing as the right answer. For the individual with a poor grasp of the material who is just guessing, it can be extremely difficult to differentiate the right answer from a good-looking wrong answer.

Exam writers create good-looking wrong answers by taking a basically correct answer and modifying it with a misconception. Here's an important point for you to remember as you're taking your exam. When you're considering the various choices, don't be looking for truth in the answer, *be looking for error*!

All answers will have some semblance of truth in them. Only one will contain no error. The amount of error incorporated in the test answers determines the difficulty of the test. The less error, the more difficult it is to distinguish the right answer from the wrong one.

Let's look at question two in Fig. 2 and use it as an example. Question two is a definition question. The correct answer is C: diode detector. Now look at all the incorrect answers. The words "diode" and "detector" are sprinkled through the wrong answers. They are the truth part. The balance makes up the error part.

It takes a thorough knowledge of the material to answer the question. If all you can remember is that it's "some type of detector" or "it had a diode in it," your chance of guessing correctly will be minimal.

Now that you're aware of these good-looking wrong answers, be careful to stay clear of them on your exam. Don't jump at the first answer that looks appealing. Look at it closely. Remember, you're looking for *error*, not *truth*.

The Multiple Types of Multiple Choice

Although the whole exam is multiple choice, all the questions won't have the same format. In fact, they break down into three distinct types with a different technique needed to correctly answer each type. Let's look at each of them. My goal is to give you a practical technique for getting what you do know down on paper in the form of a correct answer.

Problem questions. The first kind is the problem question. Question one is an example of this kind. This question provides some information about the circuit and then, based upon this information, asks you to determine the value of some other portion of the circuit. To be able to answer this question, you must be familiar with electronic formulas.

The most important step in correctly answering this type of question is to keep your eyes off the answers. I strongly advise that you cover them with a sheet of the scratch paper provided with the exam. The choices that the exam offers are irrelevant at this point and will bias your thinking if you read them.

Having covered up the answers, read the question carefully. Note all the information given. Your answer must be based on this information alone. Don't read anything into it.

Next, determine what steps you're going to use to arrive at the answer. In question number one you could say to yourself, "I'm going to divide the voltage by the amperage to get the resistance."

What is the simplest form of an amplitude modulation detector circuit?

A) Transistor detector
B) Balanced detector
C) Diode detector
D) Diode series demodulator
E) Diode rectifier

Fig. 2. Sample question two.

Usually the questions are not this easy. You'll find yourself having to do two or three intermediate steps to arrive at the final answer. In the longer problems, this technique really pays off. If you think the problem through in advance, you are less likely to stop short of the final answer or become confused.

The final preparatory step is to decide what is the correct unit of measure for your answer. Is it Ohms, volts, uH, or pF? Determining this now can help you avoid some of those good-looking wrong answers. It's common to find the result of some *intermediate step* listed among the answers. Don't get caught.

While all this seems time-consuming and unnecessary, it's neither. What you've done so far you would have done anyway. The advantage is that you are less likely to make an error if you do all the reasoning in a single step rather than piecemeal as you go. In addition, knowing what you're doing tends to take off some of the pressure. As you relax, you'll probably do better work.

Now start your work by writing down your formula in its symbolic form. It doesn't matter if it's as simple as Ohm's Law. Write it down.

Right now I can hear someone saying, "Hrump! That's dumb. I'll bet Extra-class hams don't write down formulas!"

Well, maybe they do and maybe they don't, but you aren't an Extra (yet). Frankly, it doesn't matter if you ever write one down again after the exam. It is important that you get the right answer this time, and writing it down reduces the possibility of skipping steps in the procedure.

Besides, if you goof, everything's written down on paper in logical order so that you can recheck your work.

Once you've arrived at your final answer (making sure that it's in the same unit of measure that you determined beforehand), uncover the test answers and compare your answer to those listed.

Just a personal observation here: I've rarely arrived at the exact same answer as was listed in an FCC exam. The difference probably lies in where we rounded off very large numbers. Your answer should be close, however. Pick the one closest to yours if you're satisfied you've made no mistakes in your calculations.

Does this sound like a lot of work? Actually, it's no more than you would do any other way. What you have done is to force yourself to think your way through the problem first, then to solve it by following a pattern of logical steps, and finally to avoid letting miscues from those good-looking wrong answers bias your reasoning.

Definition questions. The second kind of question that you'll encounter is the definition question. It's just what it sounds like. You must choose a word or phrase from the list of answers that the definition in the ques-

A low-pass filter attenuates—

A) —all frequencies below its cutoff.
B) —all frequencies above and below its bandpass.
C) —all frequencies in its bandpass.
D) —all frequencies above its cutoff.

Fig. 3. Sample question three.

A low-pass filter attenuates—

F **A)** —all frequencies below its cutoff.
F **B)** —all frequencies above and below its bandpass.
F **C)** —all frequencies in its bandpass.
T **D)** —all frequencies above its cutoff.

Fig. 4. Another look at question three.

tion best describes. Question two in Fig. 2 is our example.

Our number one rule here is the same as with the problem question: Don't look at the answers. Cover them with a sheet of scratch paper. They're irrelevant and can only tend to bias your thinking.

Now, with your answers covered, read the definition carefully. While reading, pay close attention to any limiting words such as "only," "all," "most," "always," etc. These words can affect the answer to the question. Make sure you've noted them when forming your answer.

Having read the question, decide (still without looking at the test answers) what *you* believe the answer to be. Now you may uncover the exam answers. Your answer will probably be on the list. If not, there will be one that you recognize as meaning the same. You've found your answer.

Again you have gone through a thought procedure that has forced you to arrive at the answer on your own. The definition-type question is where you are most susceptible to the good-looking wrong answer.

Statement questions. The final kind of question is the statement question. This question differs substantially from the two kinds discussed above. Let's look at question number three in Fig. 3 and explain it.

Question three is composed of the beginning of a statement. Each of the answers forms a completion to the statement. You will be asked which one of the possible answers makes a true statement when coupled to the question. Part of the information needed to answer the question is located in the answer portion, so in this case you must become involved with the exam answers before forming your own answer.

Be cautious, because it's extremely easy to draw a wrong conclusion based on something contained in one of the good-looking wrong answers. As you look at your possible answers, you will find that most of them sound reasonable.

Remember what we said about the good-looking wrong answers being a basically true statement with some degree of error included. The answer that you're looking for here is the *only* one that makes a *completely* true statement coupled with the question. Therefore, you should be looking for *errors in reasoning.*

The best way to handle this question is to treat it as a multi-part True and False question. Look at the same question in Fig. 4. In this illustration we take the question and mentally couple it to answer A; because answer A when connected to the question makes a false statement, we have penciled an F in front of it. The same process is used as we determine that B and C are incorrect. Answer D when connected to the question forms a true statement. D, then, is the right answer.

You are more likely to get the question right if you treat each answer as a separate True-False statement and look for errors in reasoning.

Statement questions can take several forms. Some may have no information in the question. They may simply ask, "Which of the following statements is correct?" This is still a statement question and is answered using the same technique.

Statement questions may also take a negative form. You may be asked, "Which of the following is *not* true?" Special care must be taken to see that you remember that you're looking for the one statement with error. Under the pressure of the exam, it's easy to forget that the question is reversed and panic when you find two statements that are absolutely true.

What To Do When You're Not Sure

It would be wonderful if you had prepared yourself so thoroughly that you knew the correct answer to every question. That's not realistic, though. There are always the tough ones.

Let's review a couple of suggestions that might help when the going gets tough.

First, there's the old standby—skipping and coming back to it later. Usually the applicant hopes that there will be something in one of the later questions to help him answer the one he's stuck on.

This suggestion is highly overrated. Exam writers are on the lookout to ensure that information from one question doesn't answer another. The best that you can reasonably expect is to come back to the original question in a different frame of mind.

Another method of finding an answer to an otherwise impossible question is to rearrange the words in the question. Look at Fig. 1 again.

If you can't remember how to find resistance, perhaps you can remember how to find amperage. With the information given, we can rearrange the question so that we can solve for amperage. Which of the possible answers, when divided by the voltage, gives .2 Amps? Answer B is the only one.

You can do something similar with definition and statement questions. To use this system, look at each of the answers and recall everything that you can about it. Your goal is to eliminate answer choices for which you can recall some other function or characteristic.

Look at Fig. 2 again. Let's assume that you couldn't decide between answers C and E. Perhaps you were unsure because you knew that both were tied in with changing ac to dc. By reviewing everything you can on both subjects, just perhaps you'll recall that diode rectifiers are used in power supplies. Since you can think of another application for diode rectifiers (answer D) but can't think of another use for diode detectors (answer C), then diode detectors is your best choice.

I'm offering no guarantees; nothing is going to give you the answer when you don't know enough. The hope is that one or another of these suggestions may shake something out of the old brain box that you aren't aware is there.

The Follow-Through

You're finished with the exam but not with the chance for a mistake. Like everyone before you, there are probably one or more questions that you're not too sure about. What should you do?

Changing answers is a counterproductive activity.

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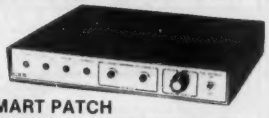

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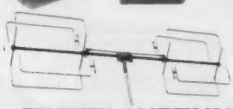

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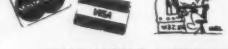

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Here's a hard and fast rule: Don't change your answers unless you either find an error in your calculation or you recall a specific piece of information that makes you realize an answer is wrong. Don't change your answer because you're having second thoughts. Your first impression is usually your best. Leave it alone.

There's one last thing that you should do before turning in your exam. Take a few seconds to relax from the tension of the exam and then go back over your answer sheet. This time you're looking for errors on your answer sheet. Look at each question and then the answer that you put down on your sheet. Is it the answer that you intend to have there? Under the pressure of the exam, you could easily have marked the wrong answer slot on the sheet. Now's the time to check the sheet and correct any mistakes.

The last step? Turn in your sheet and wait for the result. If you've followed the suggestions given here, your exam will be a true reflection of what you know—and that's what it should be.

A Word About Preparation

As I've said before, the key to passing an FCC exam is preparation. You absolutely must know the material. Think about it for a moment. How much real studying have you done? I don't mean reading the Q & A manuals, I mean real honest-to-goodness studying.

Before you waste time and effort taking the exam, consider spending some time, effort, and money on a formal course of study. Not only will it help you get through the exam, it will also make ham radio more interesting.

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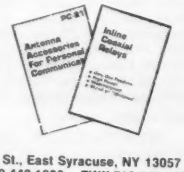

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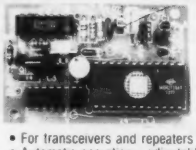

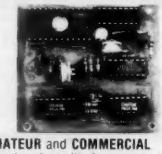

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Son of Nicad Conditioner

This intelligent discharger knows when to stop and tells you how much time it took.

I found the "Nicad Conditioner" article by W2KPE (*73*, April, 1981) quite interesting, having previously constructed a similar device. The nicad conditioner discharges a battery pack each time before then recharging it.

I recently needed to construct another for the local security force which was interested in cycling its batteries. Since they already had a battery charger set up to "rapid-charge" batteries, I decided to build only W2KPE's simple discharger (shown in his Fig. 1, reproduced here). Several problems immediately developed with his simple circuit. First, it would not stop the discharge at the desired cut-off voltage; it just turned into a buzzer. And if the battery was accidentally connected backward, the control transistor burned out instantly. My improved circuit corrects these problems and adds a simple timer to make life-testing of batteries much easier.

First, some background for those who may not have read the earlier article. The nicad batteries commonly used in hand-held transceivers have one undesirable characteristic: memory. They tend to remember the way in which they have been used. If they have been used only lightly, or not at all, any attempt to heavily and fully discharge them will result in a quick discharge—much quicker than their Amp-hour rating would suggest. (See Fig. 2.) This is especially true if they have been continuously charged without use for a long period. It has been shown that completely charging and discharging the battery several times (cycling) will erase the memory and restore full capacity.

A single nicad cell may be safely and fully discharged by merely placing a suitable load resistor across it (Fig. 3) and waiting for the voltage to go to zero. This, however, is not suitable for discharging nicad battery packs. If we let the nicad pack discharge to zero, a very dangerous phenomenon can occur. Some of the cells in the pack will discharge to zero before the others, due to mismatch of cell capacities. The cells which reach zero volts first will still have current being forced through them by the others. This will tend to reverse-charge (change the polarity of) these cells. Once a nicad is reverse-charged, it is very likely to short out. If a single cell in a pack shorts out, it will no longer take any charge and can only be rescued by heroic measures.*

To reduce the possibility of reversing any cells, it is good practice to halt the discharge of a nicad pack when its voltage drops to just less

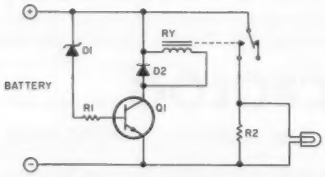

Fig. 1. K2KPE's conditioner/discharger circuit.

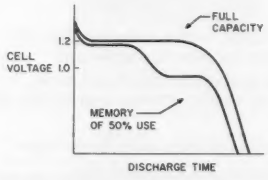

Fig. 2. Nicad discharge characteristics. Note early drop associated with memory.

*"Zapping Dead Nicads to Life," K2OAW, 73, January, 1976.

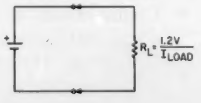

Fig. 3. Single-cell discharger.

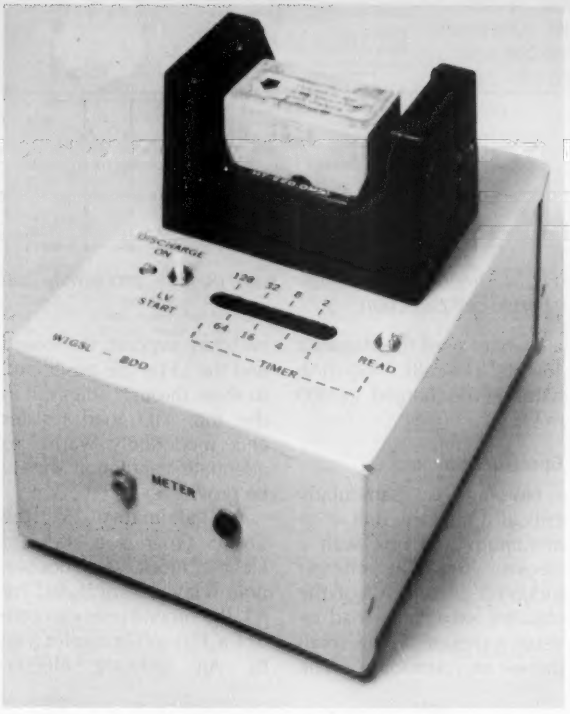

Photo A. The mounting of the discharger is not critical. This version was built into a 3" × 5" × 7" mini box.

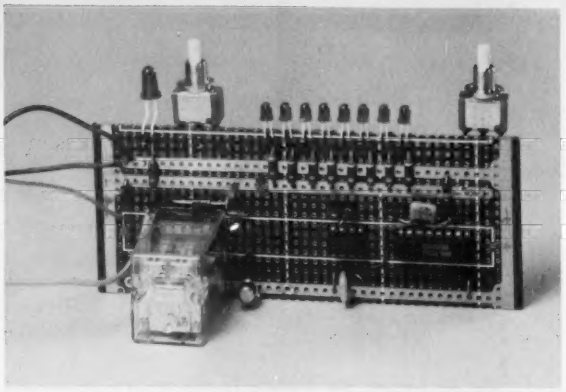

Photo B. The discharger and CMOS timer are built on a piece of IC perfboard.

than 1 volt per cell (10 to 12 V for a 12-cell, 15-volt battery pack).

W2KPE's final circuit, with a latch to start the charger, probably worked just fine. However, his basic circuit has two problems:

1) When the battery reaches the point of discharge ($V_{bat} = V_z + .7$ volts), the relay opens and removes the load. The battery voltage increases when the load is removed, causing the relay to pull in, loading the battery, and the cycle repeats rapidly. This makes a good buzzer to tell you the battery is discharged! However, it leads to a serious life problem for the relay, and I prefer to use an LED as an indicator to minimize noise pollution.

2) If the battery is connected backward, virtually the entire battery voltage is placed across Q1's base-emitter junction. Unfortunately, the breakdown voltage of most transistor base-emitter junctions is less than 6 volts. Once the junction breaks down, there is nothing to limit the current flow and the transistor burns out.

In my improved circuit (Fig. 4), the discharge cycle is started via zener 1. Z1's voltage was chosen so that the discharger will start automatically only with a good, fully-charged battery. Once the relay pulls in, zener 2 is connected. The battery will continue discharging until its voltage drops to less than $V_{Z2} + 2.1$ V. The series diode, D1, prevents polarity-reversal burnout. D3 keeps R2 from drawing current (through Z1 and Z2) with the relay open.

To use the discharger, first charge the battery in the normal way and then connect it to the discharger. If the discharge LED (D4) comes on, there are no shorted cells. If not, the battery has a shorted cell or may not have been fully recharged. S1 allows the discharge of low-voltage batteries to start. Once the discharge cycle is started, just sit back and wait for the LED to go out. The length of time that the LED stays on is proportional to the battery's capacity.

A discharge timer (Fig. 5) is a very useful addition. It allows a relative measurement of battery capacity without constant attention. The circuit measures the length of time it takes to discharge the battery. To use it, discharge the battery as above. Once the LED goes out, push the "read" button before removing the battery. The number of minutes it took to discharge is displayed in binary by LEDs D5 through D12.

The timer circuit is quite simple. IC1, a 555 timer, runs as a 1/64-minute oscillator whenever the relay is pulled in. Its output drives a 14-bit CMOS counter, IC2. The last 8 bits are displayed by LEDs D5 through D12. R6 and C2 act to reset the count to zero upon battery insertion. The CMOS counter is always connected to the battery. Its current drain is so low that it does not further discharge the battery once the relay opens. As long as the battery voltage remains above 3 volts, it will remember the discharge time. S2 connects the display LEDs only when a reading is desired, so that the battery will not discharge significantly after the relay opens.

I was only interested in relative discharge times, so the timing of a 555 was adequate. A crystal-controlled clock could be substituted if greater accuracy is needed.

Design

Select zener 1 so that $V_{Z1} + 1.4$ V is just less than the fully-charged battery voltage. Select zener 2 so that $V_{Z2} + 2.1$ V is your desired cutoff voltage (usually equal to 1 V per cell in the battery).

Zener Diodes

In selecting zener diodes, I ran into two problems:

1) They are made with fairly broad tolerances; usually I had to pick from several to get the exact voltage I wanted.

2) Above 10 volts, they are available only in fairly coarse steps.

Since the cutoff voltage is not critical, this caused no problem with Z2. However, I wanted to set the turn-on voltage fairly accurately. My solution was to stack 2 zeners in series for Z1 (see Fig. 6). The zener voltages effectively add. Because low-voltage zeners are available in finer steps, this made possible a more exact setting of the turn-on voltage.

I started with the existing Z2 (8.2 V) and placed a 5.6-volt Z1′ in series, giving an equivalent V_{Z1} of 13.8 volts. This set the turn-on voltage at 15.2 volts.

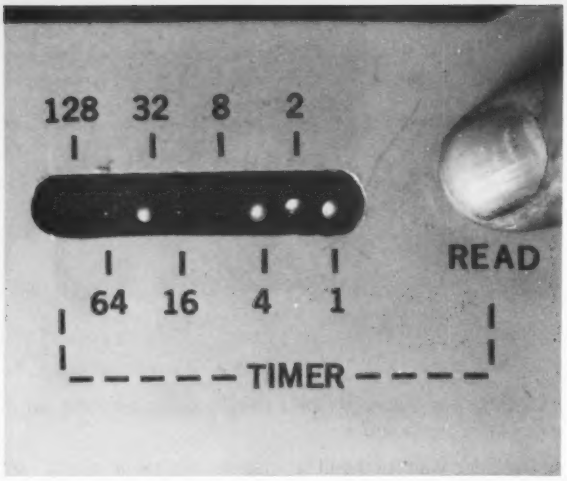

Photo C. Press the read button and see the discharge time in binary form. This battery has been discharging for 39 minutes (32 + 4 + 2 + 1).

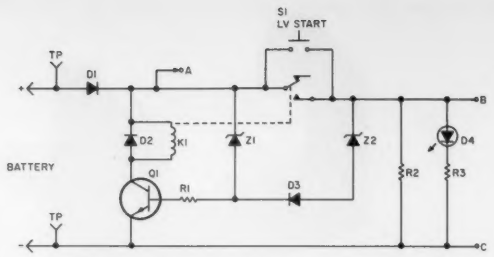

Fig. 4. Improved discharger with polarity protection and shorted-cell detection.

Zener Substitute

A crude but effective substitute for the zeners can be made with several series-connected forward-biased diodes. Eight series silicon diodes will work as a 5.6-volt "zener." Each additional diode raises the voltage by about .7 volts. Any small silicon diodes such as 1N914s will do. While series diodes take up much more room, they offer the advantage of easily setting the voltages with good resolution (.7 V), and at 10 for $1 (Radio Shack part no. 276-1122), they are cheaper and easier to get than standard zeners. The voltage drop across each diode is not very precise, so you may have to experiment to get the exact voltage you need.

The load resistor should draw about the same current as your transceiver does in transmit ($R2 = V_{bat}/I_{trans}$). R2 will get hot and must be a power resistor. If your load current is fairly low, you may want to include the 20 mA or so that the relay and indicator LED draw in the discharge calculation. Because the CMOS counter can only safely drive 3-mA loads directly, set LED current-limiting resistors R7 through R14 for 3 mA at full battery voltage.

The values in the parts list are what I used for Motorola 15-volt (12-cell), 450-mAh batteries discharged at 300 mA.

Construction

Nothing is particularly critical. I built my unit in an aluminum Bud box, with a sleeve from a charger mounted on top. All of the circuitry except the load resistor is mounted on a small piece of perfboard. The switches support the board and the LEDs are positioned to show through holes cut in the top. The load resistor gets moderately warm, so adequate ventilation should be provided.

An alternative to the CMOS timer is a standard electric clock. If a double-pole relay is substituted for K1, the second pole can control a 110-volt-ac outlet (Fig. 8). An ordinary electric

Parts List

Part	Description	Radio Shack part number	Price
C1	1-uF, 50-V (16-V)*	272-1419	$ .49
C2	.33-uF, 50-V (.47, 16-V)	272-1417	.49
D1, D2, D3	1N4001 silicon diode	276-1101	.75
D4	Jumbo red LED	276-041	.40
D5–D12	Mini red LED	276-026	3.16
IC1	NE555 timer	276-1723	.99
IC2	CD4020B CMOS counter	Active Elec.**	.63
K1	SPDT relay, 12-V, 1000-Ohm coil	275-003	2.99
Q1	2N2222 NPN transistor	276-1617	.20
R1	8.2k, 1/4-W (6.8k)	271-1333	.08
R2	50-Ohm, 25-W (10-W)	271-133	.45
R3	1.8k, 1/4-W	271-1324	.08
R4	1-meg, 1/4-W	271-1356	.08
R5	180k, 1/4-W (150k, 1/2-W)	271-047	.09
R6	100k, 1/4-W	271-1347	.08
R7–R14	5.1k, 1/4-W (4.7k)	271-1330	.63
S1, S2	SPST NO push-button	275-1547	1.00
Z1'	1N751 5.1-V zener (1N4733)	276-565	.45
Z2	1N756 8.2-V zener (see text)		
	Metal chassis (5.25″ × 3″ × 2″)	270-238	2.49
	IC perfboard, 1.5″ × 4″ scrap	276-168 (2″ × 3″)	1.95
	Charger contact sleeve	Motorola***	
	for HT 220 "Omni" (I have often	P/N 15-84799H03	4.55
	found fully-assembled used	+ 2 04-84734H01	.18
	charger sleeves at ham flea	+ 2 39-05605A01	1.32
	markets for only $2–3.)	+ 2 14-82296E01	.80
		+ 2 41-82093A02	.53

* All of the parts I used were found in the depths of my junk box. I have listed the nearest equivalent Radio Shack parts where possible. Any difference between the part used and the (Radio Shack) part is noted with parentheses.

** Active Electronics, PO Box 8000, Westborough MA 01581.

*** Motorola C & E, 85 Harristown Rd., Glen Rock NJ 21076. For other radios, either contact manufacturer for charger replacement part or home-brew suitable contacts out of nails or sharpened screws and plastic.

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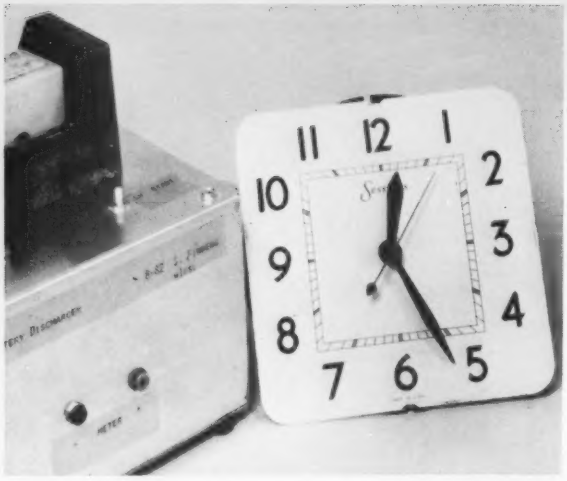

Photo D. If you don't like ICs, use an electric clock. This discharger uses the guts of an old kitchen clock as the timer.

clock can then display the elapsed time. While this is easier to build and read, the cost of the clock is higher, it would not reset itself, and it is not as portable.

A few words of caution: This device is very useful but it is not a panacea. Nicads can lose capacity for reasons other than memory, in which case cycling will not restore full capacity. One of the prime causes of early failure is overly-rapid charging, leading to overheating and electrolyte discharge. Once a cell's seal has been broken and the internal electrolyte vented, there is no way to restore lost capacity. For this reason, unless you are very confident that your "rapid charger" can limit any temperature rise, I would never recommend charging any faster than at a .1-C rate. This means that the charge current is set to one tenth the milliampere-hour capacity (C) of the battery. For my 450-mAh batteries, this requires a charge current of 45 mA. It takes about 16 hours to fully recharge a battery at this rate. Most manufacturers claim their cells can withstand this charge rate indefinitely without failure.

Nicads have a finite life of only several thousand discharge cycles. Since each full cycle by the discharger represents one of them, it seems best not to allow your battery to develop a memory by fully using it (transmitting) rather than cycling it. Unfortunately, many hams' lifestyles don't permit this. The radio sits in the charger till the weekend, or maybe they prefer to listen most of the time. In these cases, occasionally cycling the battery makes sense, especially before big events when you will need longer-than-usual service.

In summary, nicad batteries need occasional cycling to remove memory effects. Care must be taken in discharging nicad batteries to prevent cell-reversal damage. An improved discharge device is presented for use by those who already have a suitable charger. The improved discharger can detect the presence of shorted cells, is not subject to reverse-voltage burnout, and is silent in operation. A timer has been added to aid in judging battery capacity.

Over the last several years, this battery discharge device and its predecessor have kept my batteries up to snuff and enabled me to salvage several perfectly good battery packs from the reject piles of local commercial users. ■

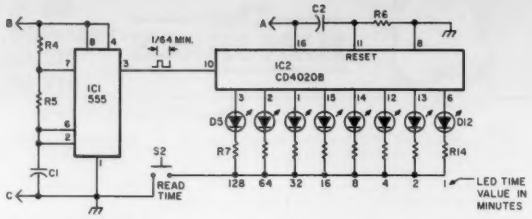

Fig. 5. Discharge timer. Each lit LED represents a fixed time since the discharge started. Add all the illuminated times to get the total time of discharge.

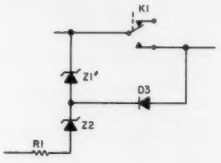

Fig. 6. Zener arrangement for improved resolution in setting turn-on voltage.

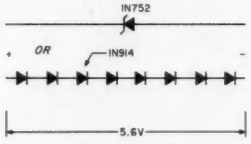

Fig. 7. Series-diode substitute for zeners. Any silicon diodes will do. 1N914s or 1N4001s are fine.

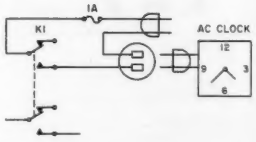

Fig. 8. Electric clock used as a timer. This requires an extra pole on relay K1.

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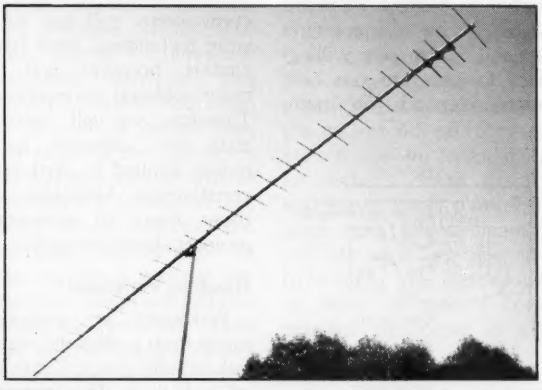
Featuring straight forward construction, and an innovative tapered boom that greatly reduces windload and adds strength and durability. Virtually unbreakable, insulated, 3/16" rod parasitic elements are anchored through the boom to insure years of trouble-free performance.

For the satellite enthusiasts, the 2M-22C high gain 2 meter, circular polarized antenna, features the same rugged construction and total flexibility as our very popular 2M-14C with a 2db increase in gain.

Four or more 2M-22Cs make an excellent array for Moonbounce (EME) by eliminating Faraday fading.

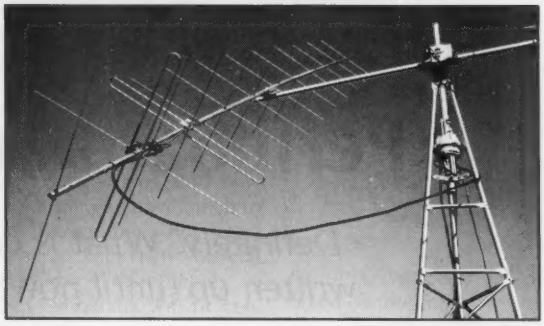
Fiberglass/aluminum stacking frames are available as well as 2 and 4 port power dividers and phasing harnesses to optimize the performance of these type arrays.

Watch for our new elevation drive system coming soon.



432-30LBX

BANDWIDTH	430–440 MHz
*GAIN	17.3 dBd
BEAMWIDTH	(E) 19°, (H) 20°
FEED IMP	50 ohms unbal.
BALUN	included
BOOM LENGTH	21 ft. 11 in.
F/B	20 dB F/S 30 dB
VSWR	1.5:1
WINDLOAD	1.71 sq. ft. (max.)
TURNING RADIUS	12 ft. 4 in.
WT. (lbs.)	9 lbs.



2M-22C

BANDWIDTH	144–148 MHz
*GAIN	13 dBdc
BEAMWIDTH	(E) 32°, (H) 32°
FEED IMP	50 ohms unbal.
BALUN	(2) 4:1 coaxial
BOOM LENGTH	19 ft. 1 in. (tapered)
VSWR	1.5:1
WINDLOAD	1.85 sq. ft. max.
ELLIPTICITY	± 1.5 dB max.
CIRCULARITY SWITCHER	CS-3 included
WT. (lbs.)	11 lbs.

2M-16LBX

BANDWIDTH	144–146 MHz
*GAIN	(144 MHz) 14.5 dBd
BEAMWIDTH	(E) 26°, (H) 29°
FEED IMP	50 ohms unbal.
BALUN	4:1 coaxial, 2 KWPEP
BOOM LENGTH	28 ft. 1 in. (tapered)
VSWR	1.5:1
WINDLOAD	(H) 1.75 sq. ft. (V) 2.44 sq. ft. max.
WT. (lbs.)	10 lbs.
TURNING RADIUS	15 ft. 5 in.

See the complete line of KLM antennas and equipment at your local dealer, or write for our catalog.

*To provide a more accurate and consistant gain figure, performance of this KLM antenna has been carefully measured and correlated in accordance with National Bureau of Standards Note #688. This gain figure may appear somewhat conservative when compared with others commonly found in conventional industry literature and based on older, less exacting rating methods.

KLM ***electronics, Inc.***
P.O. Box 816
Morgan Hill, CA 95037

Perfboard and Soldertail?

Definitely. What is commonly done is never written up (until now) but always appreciated.

L. B. Cebik W4RNL
2514 Dereck Drive, H-1
Knoxville TN 37912

Many ham authors specify perfboard construction for their one-time projects. Then they say almost nothing more about the mechanics of building the circuit on the board. Photos and sketches give us a general idea of the construction methods, but very few articles exist on using perfboard construction effectively. In the spirit of sharing some ideas that have worked well for me over the years (along with some cautions about a few things that lead to trouble), let's see how we can improve our perfboard projects.

Printed circuit boards for transistor and IC projects make construction a breeze. Unfortunately, PC boards are not practical for every project. If an author does not provide us with a source for ready-made boards (and we should not expect every author to make a PC-board layout for his own one-time project), then our willingness to generate our own boards depends on many factors, including time, ability, and desire to design and fabricate the etched pattern. For many small-to-moderate-size one-time circuits, perfboard construction is more practical.

Many types of digital circuits which use few passive components call for wire-wrap techniques. Most ham circuits, however, will require soldered connections. Therefore, we will concentrate on soldertail techniques applied to perfboard construction. Adaptation of these ideas to wire-wrap projects should be easy.

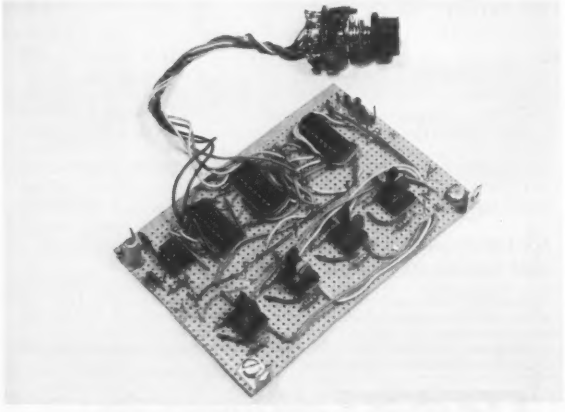


Photo A. An IC and transistor perfboard project with L-brackets for vertical mounting.

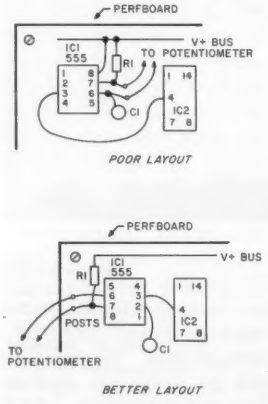


Fig. 1. Planning component layout on perfboard.

Handling Perfboard

Perfboard is generally made from a phenolic material, usually about 1/16th of an inch thick. This immediately limits its utility since it is prone to slight warps in readily-available grades. For PC boards, use the more stable epoxy glass material. For point-to-point wiring on perfboard, the warp is usually not significant in boards up to 5 by 7 inches.

There are several hole patterns for perfboard. Hole separations of .1, .187, and .2 inches are common, but .1-inch hole spacing is the most practical for ICs. For most uses, .042-inch hole diameters are best, although .062-inch hole diameters are available. The smaller holes again work best for IC projects. In fact, the .042-inch holes on .1-inch centers precisely fit the needs of ICs and their sockets. Conveniently, Radio Shack carries this type of board in three sizes: 2.75, 4.5, and 8 inches long, all by 6 inches wide. My own preference is to buy the larger sizes and cut the precise size board my latest project requires.

Phenolic material has some of the properties of mica in that it chips in jagged layers and does not break cleanly. However, with only a little care, it cuts and drills easily. A hack or coping saw with a fine tooth blade cuts perfboard well if you align your cut with a row of holes. Keep the saw blade as parallel to the board as possible, with no more than a 30-degree angle. This technique reduces binding as you pass holes, and the result is fewer broken phenolic scraps. For safer sawing, I clamp the perfboard between two quarter-inch-thick lath strip scraps with a bench vise. The edges of the lath strips are within a row or two of the holes I intend to cut along, which stabilizes the perfboard, and the vise cuts into the wood and not the phenolic. I keep any leftover pieces of perfboard more than one inch square, since I never know when I might need one for a miniature project or a small circuit addition.

Drilling perfboard for screws and other hardware is fairly simple. Use a scrap of wood to back up the perfboard when drilling; this prevents drill-bit snags that can shatter a small board. In general, a 1/8-inch diameter drill bit clears 4-40 screws nicely, while 9/16 is the correct drill-bit size for 6-32 screws. I usually avoid drilling holes larger than 9/16-inch diameter in one try since the large drill bits tend to snag the phenolic material more easily. For larger openings, drill out the perfs inside the desired perimeter until the scrap falls out and then file the material to the final opening size. Another technique is to drill the corner holes, insert a coping saw blade, and saw the opening. You will usually still need a bit of finish filing. One of the advantages of perfboard is that you can add larger openings for relay sockets and other components more readily than with PC boards.

Generally, I try to do all necessary drilling and cutting at one time before mounting components to get in the way of clamping and backing. There are few more frustrating accidents than to have your complete circuit wired, only to watch the perfboard crack or shatter as you try to drill just one more mounting hole.

Perfboard Layouts

One secret to easy electronic construction is paper. The more complete your plans, the more smoothly the project will go together. Even if you are reproducing an author's circuit exactly and have good photos to guide you, paper planning still can save you time and frustration. As inexpensive as many of today's components are, paper is still cheaper.

Example 1. Being able to cut and drill all holes before wiring is a matter of knowing just where they all go and what size they must be. Making some trial paper templates using the real components you have on hand will allow you to determine their size and spacing.

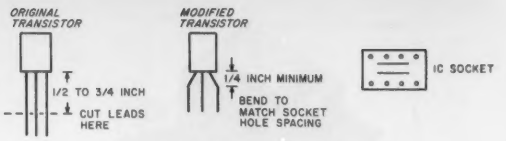


Fig. 2. Trimming transistor leads to fit IC sockets.

In addition, the practice also will let you revise the project and spot errors or neglected needs. You can see how much room you need to clear the mounting brackets or posts, how much space the transformer mounting foot requires, and how much filing you will need to do after cutting a hole for a relay socket. Then you can plan the circuit details so that everything will fit conveniently.

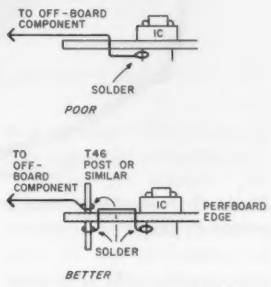


Fig. 3. Using posts for off-board connections.

Example 2. Equally important is the component layout. Fig. 1 illustrates two important considerations: socket pin orientation and component placement. The IC timer, a 555, runs its timing components to pins 6 and 7, while the output emerges from pin 3. Even though we conventionally think of "upper left" as the proper place for pin one, this project calls for an "inverted" placement of the 555 socket. Now the timing components are near the board edge so that leads to the potentiometer are conveniently reached. Too, the output pin is close to the input pin of the next IC.

In digital circuits, socket placement can make jumper wiring either easy or a jumbled nightmare. In counting and readout circuits, you may have several outputs to several inputs. Aligning the jumpers neatly makes short work of the wiring. Having them go over and around an IC to reach the input pins invites undetectable open circuits and other typical building problems.

Leave room enough for the components that go between sockets. Perhaps the best way to be sure your plan will work is to trial-fit all components on uncut perfboard. This practice often reveals unnecessarily long leads and other minor wiring problems before you cut leads. The result is often a revised layout plan. Sometimes, when I am smart enough to have a large extra piece of perfboard on hand, I place all components on the supplementary board. Using this model, I mark the project board for cutting and drilling. Then I move the

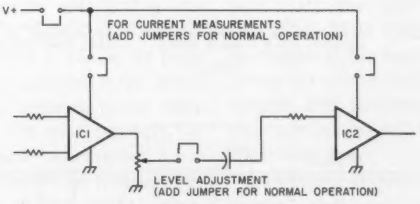


Fig. 4. Using posts to separate circuits for testing and adjustment.

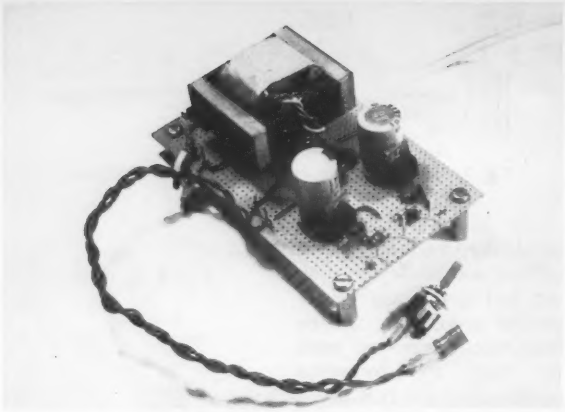


Photo B. A dual-regulated power supply on perfboard supported by posts.

components, one at a time, to the project board. This technique tends to cut considerably both assembly time and errors.

Transferring a layout plan to perfboard requires only a pencil and ruler. Measure and lightly mark the positions for holes. You also can mark the corners of IC sockets and large components for reference. The only precaution here is to eliminate pencil markings completely before covering them with components. Pencil lead is a conductor: not a good one, but good enough to have given me an additional input to a CMOS IC in one project. Erase pencil marks thoroughly just before mounting components.

Handling and Wiring Components

It would be impossible to establish guidelines for handling every kind and combination of components you might encounter, but the following ideas are adaptable to most projects.

First, use IC sockets wherever possible. Use them not only for ICs, but for switching transistors as well. An 8-pin DIP socket will handle two small transistors if you trim and bend the leads as shown in Fig. 2. The advantage of IC sockets over readily-available transistor sockets is that the latter require a fairly large hole through the perfboard. The IC socket rides atop the board with its pins sticking through.

Second, use posts for all off-board connections. Do not run off-board wires directly to components or socket pins. The strain may be too much. Fig. 3 shows

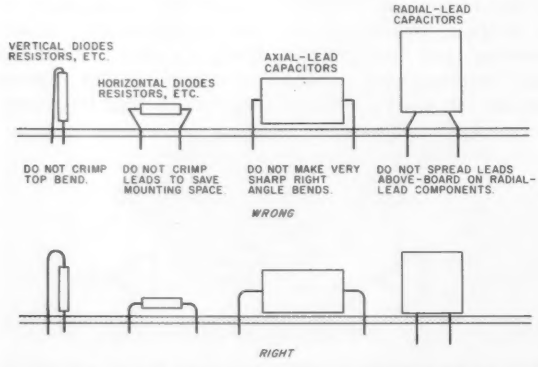

VERTICAL DIODES RESISTORS, ETC.
HORIZONTAL DIODES RESISTORS, ETC.
AXIAL-LEAD CAPACITORS
RADIAL-LEAD CAPACITORS
DO NOT CRIMP TOP BEND.
DO NOT CRIMP LEADS TO SAVE MOUNTING SPACE.
DO NOT MAKE VERY SHARP RIGHT ANGLE BENDS.
DO NOT SPREAD LEADS ABOVE-BOARD ON RADIAL-LEAD COMPONENTS.
WRONG
RIGHT

Fig. 5. Mounting components to perfboard.

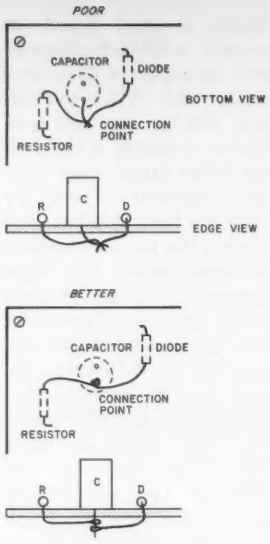


Fig. 6. Under-board component-lead junctions.

the right and wrong way to connect off-board wires. An added advantage of posts is that you can connect and disconnect off-board components from the top side, which makes final assembly of the project a much easier matter.

There are many additional uses for posts, a few of which are illustrated in Fig. 4. You can separate stages of a circuit until after testing by using a pair of posts at the output/input point; a jumper then connects the two circuits for normal operation. This technique permits you to adjust interstage signal levels with no danger of overloading the next device. Paired posts, again jumpered for normal operation, also permit current measurements during the test phases of a project as well as during troubleshooting. I prefer Vector T-46 wire-wrap posts, available through Jameco and other mail sources. The T-46 extends .4 inches above the board and .56 inches below. Its square shank and flare give it good holding power in the perfboard hole. After all soldering, trim the above- and below-board lengths. Below-board, be sure that

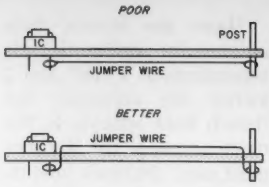


Fig. 7. Mounting jumpers on perfboard.

the post does not touch the chassis or cabinet base. Above-board, cut the post to the height of the tallest circuit component. Wire cutters do the job nicely.

Third, do not crimp components when bending their leads. Some builders prefer to top-mount all components. For this technique, Vector T-42 posts (or similar) permit soldering up to about three leads per junction. However, this method usually requires more space than making direct connections with component leads bent to pass through the board. Fig. 5 shows some right and wrong ways to handle components such as resistors, diodes, and capacitors. Axial-lead components such as resistors require curved bends to avoid eventual lead breakage. Often this takes one more hole, but that is a small price for circuit reliability. Where space is at a premium and component interaction is not a problem, vertical mounting is practical. Wherever you take care in smoothly bending component leads, you will encounter fewer cases of component strain or breakage, even if your layout does not permit instant solder support.

Fourth, when you use component leads to make connections, decide in advance for every junction which lead will serve as the key or post lead. Fig. 6 illustrates the idea. The capacitor lead serves as a post to which the resistor and diode connect. The reasons for choosing the capacitor lead

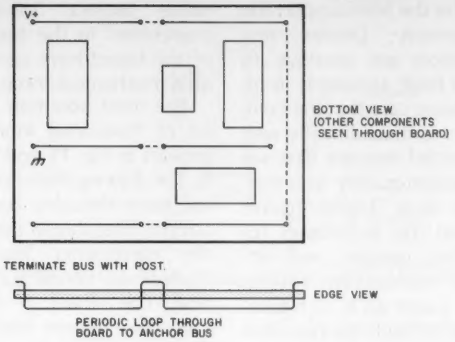


Fig. 8. Perfboard power and ground buses.

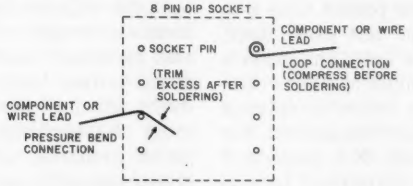


Fig. 9. Soldering leads to IC sockets.

in this example are three. The capacitor lead is the fattest and strongest and thus makes a better post. Too, the capacitor is permanent, whereas the resistor may require another value after testing the circuit. Finally, the capacitor can stand soldering heat somewhat better than the diode.

This case gives only a small sample of the reasons why one or another component may become the junction post; each will have its own rationale. Nevertheless, avoid bringing leads from many directions and simply twisting them together. The under-board layout may be as crucial to reliable circuit operation and ease of revision as top-board component placement.

Fifth, run jumpers topside and through the board at their ends, as shown in Fig. 7. This technique serves several useful purposes. It permits you to trace wiring after the board is mounted. It also takes the strain off the jumper wire, especially if you happen to snag it during construction. Standardizing on top-wire runs also reduces the chances of losing track of jumpers while building. Although excessive looping of jumpers creates an unsightly project board and potential trouble in sorting through the maze, do not put excessive strain on the wires to pull them flat against the board. Leave enough slack to prevent wire breakage, either immediate or later. Then press the wires into place.

These simple guidelines to component handling are mostly matters of common sense. You can add to the list according to your own building experiences. Unfortunately, we often forget these rules while building, usually through either haste or distraction. There is nothing like a soldering iron burning a hole in the test bench to cause us to mishandle a component. If we could only remember which component we were installing during the incident, we would know the first place to look when the circuit malfunctions. If you do not believe it happens, I have two look-alike IC voltage regulators, one positive, one negative, that I once installed under just such conditions.

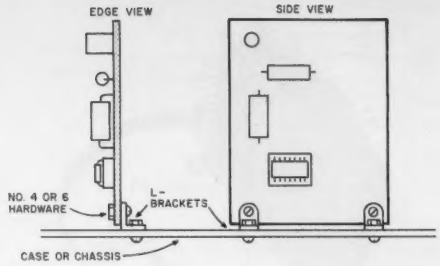


Fig. 10. Mounting single perfboards vertically.

That neither works is proof that I put each where the other should have gone.

Wiring Perfboard Projects

Wiring and soldering a perfboard project can be one of two things: easy or frustrating. Easy wiring requires that we figure out the best way to handle the peculiarities of attaching components and wires to a phenolic board with a hundred small holes per square inch. I wish that I had known what I now know (through experience) back when I miswired my first perfboard.

No. 18 copper wire is the largest that will fit through the .1-inch holes of IC perfboard. For most purposes, No. 18 wire is too large for all but heavy current buses, such as voltage and ground lines on a TTL project. No. 22 or 24 solid hookup wire works best for most wiring. Anything smaller grows hard to handle and solder. We can make off-board connections with stranded wire of the same size.

If we have made a good layout plan, the wiring task should be straightforward. For non-rf projects, I usually begin with voltage and ground buses, arranged as shown in Fig. 8. Long runs pass above and below the board at least once to anchor them in place. Rf projects that require large areas for the ground plane may not be the best projects for perfboard techniques. For dc and lower ac frequencies (up to a few MHz), perfboards and buses work well. Jumpers provide voltage and ground connections to the individual components.

Wiring IC sockets presents problems to many builders. Whether working with PC or perfboard, we manage to lose the sockets as they fall off the board the moment we turn it over to solder. There are many tricks to hold the sockets in place. If there will be unused pins, bend them inward so that the socket lightly grips the board. Some builders put a tape loop under each socket to secure it during construction. Alternatively, you can use a small flat box on which to lay the inverted board for the first socket pin solder job. Whatever the technique, solder all the power and ground jumpers first; this will lock the socket in place for the rest of the project.

The traditional rules of soldering state that every solder joint should first be a solid mechanical connection over which we then flow solder. The solder seals the joint, ensuring a long-lasting electrical connection between wire and terminal. PC boards, of course, violate the old rule as a matter of course. Component and socket leads pass through the holes and, in fact, may not touch the pad. Solder, electrically and mechanically, connects the two. So long as we do not exceed certain weight and vibration limits, the connection will be good for a long time.

Perfboard construction requires that we connect jumpers and component leads to socket pins. Fig. 9

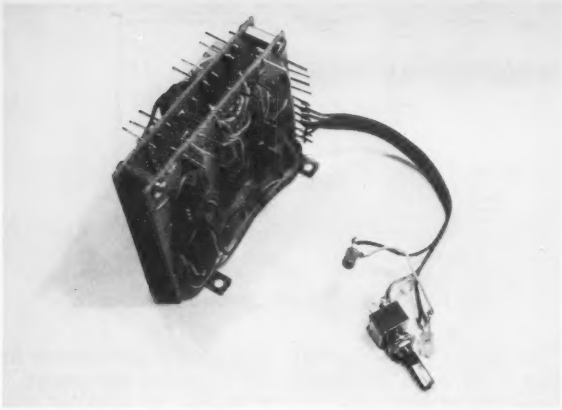


Photo C. A two-board IC and transistor project ready for vertical mounting.

shows two common techniques, and most builders use both in the course of wiring a single IC socket. No. 22 or 24 wire will bend in a loop around IC socket pins with room to spare for the loop to the next pin. However, circumstances often dictate that the partial-bend connection is most practical. Ensuring a good connection is a matter of making sure that the wire in fact touches the socket pin with natural tension before soldering. Unless the lead is under considerable stress, the connection will hold indefinitely. Use a small jeweler's awl to test each such connection before being satisfied that it will hold.

Whatever the construction method, small components used in modern circuits require careful handling. Radial-lead capacitors, such as the small electrolytic type, should be flush with the board. Unless we are careful, they will fall out of position when we flip the board to solder. Resistors, disc capacitors, and diodes should be close to the board, but not necessarily pressed too tightly lest we crimp the component lead. In many cases, the lead is stronger than the component itself. Where this is true, let the lead support the component. Diodes and transistors are sensitive to solder heat, so care is in order. Being sure that the component is mechanically well connected ensures that we can solder quickly with minimum heat. Earlier figures showed the techniques for handling jumpers and off-board connections. Finally, never solder an IC or transistor socket with the device in place.

There are two methods for wiring and testing a solid-state project. One is to wire and test each stage, one at a time. This permits ready circuit revision in early stages before component space has disappeared. For many types of IC projects, it is more convenient to wire the entire circuit and then test the stages by plugging in one or two ICs at a time (with power off and capacitors discharged). With either method, it is safer to remove ICs while making circuit additions or revisions. The IC that will fry due to static charge or excess heat is the unit of which we have only one.

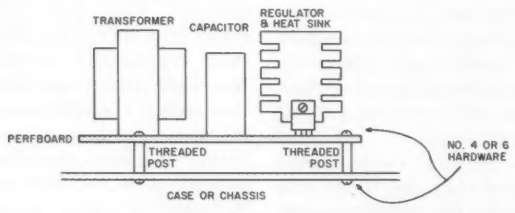


Fig. 11. Mounting perfboards horizontally.

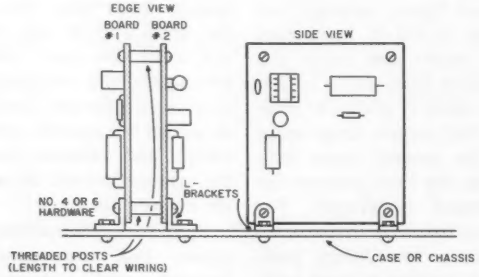


Fig. 12. Vertically mounting two perfboards.

Mounting Perfboards

The photos, besides illustrating perfboard construction generally, show different types of mounting schemes. Basically, there are only about five ways to handle the attachment of perfboards to your project case.

Fig. 10 and Photo A illustrate simple vertical board mounting using L-brackets. Digi-key and other mail sources carry this common but surprisingly hard-to-find bracket. Be sure that the board clears the case with about an eighth of an inch to spare so that you have room to align the L-brackets with the case and board holes. This is perhaps the simplest vertical mounting scheme, but it is limited by the weight and size of the project board as well as anticipated rough handling of the entire project. Vibrations transmitted to the free end of the board have considerable mechanical force.

The most common method of horizontal mounting appears in Fig. 11 and Photo B. The drawing shows mounting posts threaded for 6-32 screws. Note that in this case the transformer hardware doubles to connect to the post. The object is not to save two screws (although the space they take might be handy for other circuit components). Instead, the mounting posts support the transformer's weight directly. Had the project used corner posts, a few hard knocks might let the transformer crack the perfboard. Horizontal mounting with four-corner support is superior to L-bracket mounting only if the expanse of perfboard does not support too heavy or too dense a weight.

In most cases, hollow pillars and long screws make a perfectly acceptable substitute for threaded posts. We need not buy commercial posts, but can make our own from rigid plastic tubes. In fact, exploring the plastic packaging and worn out parts of many household items is a good way to build a stock of very useful plastic pillars, standoffs, and other items.

We can achieve superior vertical-mounting stability using two boards with a combination of L-brackets and posts. Fig. 12 and Photo C show how. Each board has its own L-brackets for four-point support. Posts connect the two boards at the four corners. With this technique, the builder can remove each board independently for repair or revision. Photo C shows separate automatic voltage- and current-measuring circuits (for a bench supply) back-to-back. The only cautions to observe with this mounting method are to ensure that the two circuits will not interact through radiation or capacitive coupling.

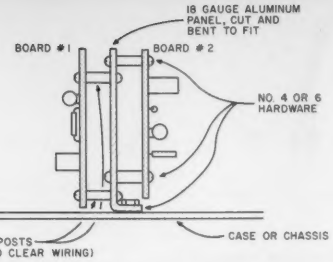

18 GAUGE ALUMINUM PANEL, CUT AND BENT TO FIT
BOARD #1
BOARD #2
NO. 4 OR 6 HARDWARE
THREADED POSTS (LENGTH TO CLEAR WIRING)
CASE OR CHASSIS

Fig. 13. Perfboard mounting with interface shielding.

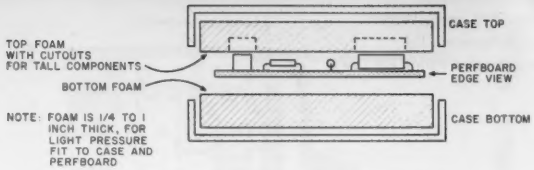

CASE TOP
TOP FOAM WITH CUTOUTS FOR TALL COMPONENTS
PERFBOARD EDGE VIEW
BOTTOM FOAM
CASE BOTTOM
NOTE: FOAM IS 1/4 TO 1 INCH THICK, FOR LIGHT PRESSURE FIT TO CASE AND PERFBOARD

Fig. 14. Packaging perfboards in foam.

Where circuit isolation is important, Fig. 13 comes into play. Two boards conveniently fit to one aluminum shield panel. The 18-gauge or thicker aluminum panel supports both boards and the builder can remove each independently. This technique is limited to cases where a simple interface shield is adequate to prevent unwanted interaction between circuits, which includes most low-power receiving and test equipment applications.

Modern packaging techniques have taught us that rigid physical mounting is not the only route to good circuit protection in the project case. For small projects, a floating mount may be both simpler and more effective than nuts and bolts. Fig. 14 illustrates the general principle. The circuit board rides between two foam pads within the case. The case presses the foam lightly to hold it in place. The light pressure also holds the perfboard securely in its place. If there are some projecting components, we can cut a few indentations into the top foam panel. This form of mounting works very well as long as the foam can exert enough pressure to lock the perfboard in place without over-stressing any of the components.

These sample mounting methods may add to your repertoire of packaging techniques. In any event, plan your packaging during the layout stage of the project, since perfboard mounting will determine some of the cutting, drilling, and wiring requirements. Of course, these mounting techniques also apply to numerous other construction techniques.

Although perfboard is handy, it is not the ideal construction base for all projects. As noted, some rf projects may require ground planes that perfboard alone cannot provide. Where PC boards are available for projects you do not want to modify, use them. However, for the one-time ham project of moderate size, perfboard construction can be as satisfactory and durable as any other. It all depends on how you handle the material. Hopefully, the collection of ideas out of my experience will spur you to share some of your own with the rest of us who regularly build with perfboards and soldertails. ■

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The conversion of an amplifier to operate down on 1.8 MHz involves more than adding a coil tap and a switch position, as the 10-meter conversion usually does. A new and larger coil assembly is required, as well as a plate choke and a filament choke with larger inductance. These add up to several components and some expense. There is plenty of room in the SB-221 to place the new components, however, making the conversion a simple one. The most difficult job is removing the switch deck that shorts out the sections of the main-output π-network inductor, and then replacing it after modification.

The SB-221 as designed by Heathkit™ comes with a 10–11-meter reject filter and tuned input circuits for 80, 40, 20, and 15 meters. All being bypassed leaves the amp with an untuned input.

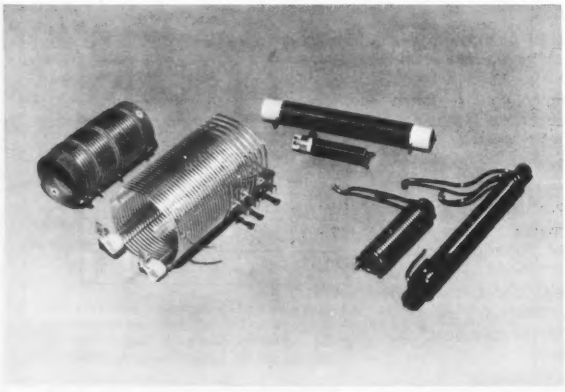

Photo A. The new components to be added to the SB-221 to convert it for 160-meter operation. The new component is the larger one in each case. The smaller original ones were removed from the amplifier.

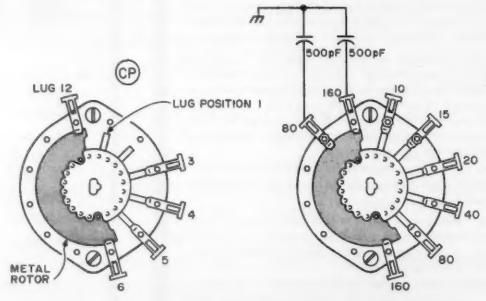

Fig. 1. The rear deck of the bandswitch as shown in the Heathkit assembly manual is at left, and the modified deck is at right. Three new switch contacts are added using new fingers or ones salvaged from old switches. They are mounted on both sides of the ceramic wafer, using #2 brass nuts and bolts. The mounting holes are already in the wafer; no modification to it is needed. The work on the switch is easy; the hardest part of the whole conversion is removing the deck and putting it back again.

Photo B. The SB-221 converted for operation on 160 through 10 meters. The new tank coil is mounted on the front panel, using two holes that previously held a plastic Heathkit label. The new larger plate choke is mounted on the wall at left, using the original plate-choke standoff. The bandswitch is removed from the partition wall, modified, and replaced.

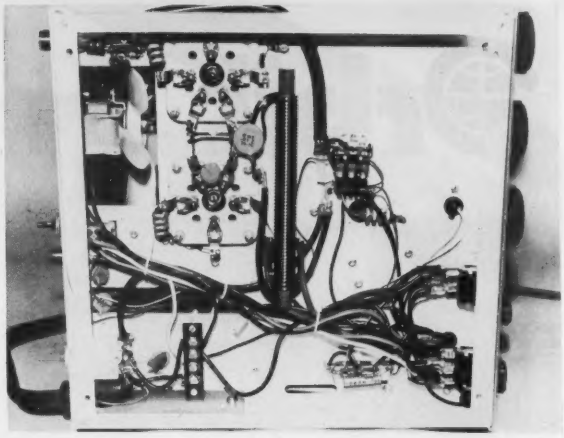

Photo C. Bottom view of the amplifier with the larger filament choke installed. It solders into the same points that the original choke did.

The new output tank coil is approximately 33 μH which uses all of the 250-pF tuning capacitance that is available to resonate at 1.8 MHz. Although a larger capacitor would give a better Q, the resulting efficiency of the amplifier is almost as good on 160 meters as on 80 meters, so that the output on 160 will not suffer from lack of a larger tuning capacitor. Additional output capacitance is also switched into the π-network to provide a 50-Ohm output on 160.

Components

Photo A shows the new components added, with each one next to the corresponding one removed from the SB-221. The new plate choke has an inductance of 200 μH rather than the 50-μH original choke. This is the Barker & Williamson Model 801. It is space-wound over about one third of its length to avoid parallel resonances at the higher frequency bands and close-wound for the rest of its length for greater inductance. The B & W filament choke, FC-25A, has about six times the inductance of the smaller Heath choke and is used to prevent the drive power from going back to the filament transformer or to ground. The plate tank coil is a B & W 195-3, a variable-pitch coil using #14 wire, 2½" in diameter, 5¼" long. It is mounted on the front panel using the two holes that originally held the Heathkit label. Cable clamps around the plastic rods of the coil support it. These are furnished with the coil.

Construction

After taking off the cover and refamiliarizing yourself with the layout, remove the 3-500 tubes. To bypass the input circuit, connect a length of RG-58 from terminal 4 of the T-R relay directly to C32 at the tube sockets. Remove the coax cables that had been connected to these points and cut them off where they pass through the chassis into the grid compartment. Ground both ends of the braid of the new piece of cable.

If the stiff wire leads on the new filament choke are bent as in Photo A, the larger choke will fit, using the same solder points as the smaller choke (see Photo B). Make sure that the filament choke is close enough to the chassis that it will clear the bottom of the case.

Remove the rf plate choke (Heath #45-61) by unsoldering both wires to it and unscrewing it from the spacer. Save this spacer to mount the new choke. Put a 6-32 nut on the long bolt sticking out from the partition to prevent it from falling loose, and cut the excess bolt off. Drill and tap one end of the 3/8"-diameter spacer for 1/4"-20 threads and put a 1/4"-20 stud into that end. This will thread into the ceramic form of the new choke. This spacer is mounted on the opposite wall of the amplifier (Photo C), using an 8-32 screw through one of the perforations in the wall.

Remove both the 80-20 coil and the 15-meter coil made from silver-plated tubing. Save this 15-meter coil; it will be used in the modified version, tapped for 10 meters. Leave the fiber standoffs that had held the old tank coil in place so that the screws holding them don't fall into the grid compartment.

Unsolder all of the wires and the capacitor from the rear deck of the bandswitch. By reaching down behind the panel with needle-nose pliers, you can bend back a tab on the outer part of the detent layer. This lets the switch rotate through 12 positions rather than the original four. Since the input circuits are no longer utilized, the back wafer that switched the coil is all that need be changed. Remove it by

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loosening the bolts that hold it to the partition wall. The nuts will fall down into the grid compartment and must be recovered. Three new contacts must be added, as shown in Photo D. This is not so difficult. Many switches have similar contacts. Drill six out and mount them in the holes already present in the ceramic deck with #2 hardware. One of the new contacts is for the extra loading capacitor for 160.

Photo D. Front top view of the modified SB-221. The two screw heads above the capacitor knobs are the only outward change in the appearance of the amplifier. The 160-meter position on the bandswitch is the one to the left of the 80-meter position; it need not be marked. Similarly, the 10-meter position is the one to the right of 15 meters.

The reworked switch deck is replaced, using the original hardware and spacers. Getting the nuts back on the bolts when they are almost hidden is a nasty job. Bend a piece of wire to hold the nut and get it started.

The new switch positions are shown in Photo D. No change was made to the switch labels on the front. There is no confusion, however; the 160-meter position is the one to the left of 80, and the 10-meter position is to the right of 15.

The Heathkit plastic nameplate is removed by prying off the Tinnerman nuts, leaving two holes to mount the new coil behind the front panel. Plastic cable clamps and small angle brackets are attached to the plastic ribs of the coil, as in Photo A. The 160-meter end of the tank coil is soldered to a lug attached to the front of the loading capacitor. There is room to remove the nut from the threaded rod there and put a solder lug under it. At the other end of this rod another solder lug is placed under the nut and a heavy wire run down to the 160-meter switch terminal, where the output wire running to the T-R relay also is connected.

The 7-turn 15-meter coil is connected from the tuning-capacitor top plate to meet the main coil, as in Photo C. This involves bending the tubing at the ends and cutting some from the coil. Be sure to keep the approximate size and spacing the same.

The 10-meter tap on the tubing coil is 4½ turns from the tuning-capacitor end. The 15-meter tap is now 6½ turns in, not at the junction of the two coils. The tap for 20 meters is 2¾ turns from the junction, 40 meters is 7¾ turns from the junction (5 turns from the 20-meter tap), and 80 meters is 4 turns from the 40-meter tap. These taps are made with clips furnished with the tank coil. Connections between coil and bandswitch are made with #14 solid copper wire, as in Photo C.

An additional 500-pF, 1-kV output capacitor is soldered to the bandswitch. It is placed next to the original one for the 80-meter band. The shorting rotor connects both into the output on 160, as shown in Photo D.

The tank-coil taps can be checked with a dipper before applying voltage. The tubes should be in place (but no power applied) since they will contribute to the capacity of the system and affect the 15- and 10-meter tuning. The 15- and 10-meter bands should resonate with the main tuning capacitor near minimum, beyond the shaded area marked 20–15 on the panel. Small changes can be made by stretching or compressing the turns of the coil, and larger inductance variations by changing the location of the taps.

An improperly located coil connection will show up as inefficient operation on that band. If the inductance is too large or too small, the power out will be reduced for a given amount of drive. It is worth measuring the power into a dummy load to check on efficiency, rather than just being satisified with a resonance, a dip in the plate current.

A parts kit for this conversion is offered by Barker & Williamson, 10 Canal Street, Bristol PA 19007, for $49.95. The K-160 consists of the Model 801 plate choke, FC-25A filament choke, 195-3 π-network inductor with taps and mounting clamps, and a 500-pF output capacitor. ■

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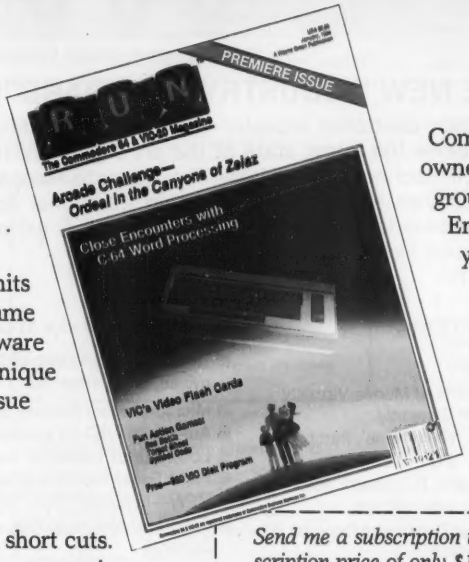

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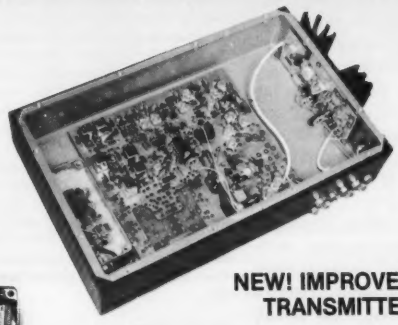

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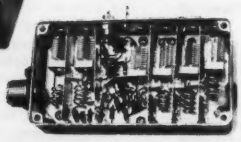

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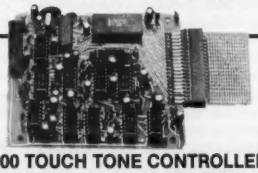

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ARE VKs BAD QSLERS?

It has become noticeable lately from on-air contacts and correspondence that the VKs are getting a reputation of being bad QSLers. After looking at my log books over the years, I disagree, and feel, in fact, that the opposite is true. I will give an example later of why I feel this way.

WIA QSL Bureau

The Wireless Institute of Australia maintains both inward and outward QSL bureaus in all states, with the VK3 bureau being free of charge to all members of the Institute in VK3. (Other bureaus in Australia do charge for this service.) Nonmembers still can collect their cards free of charge from the bureau, but a fee of 10 cents per card is charged for all nonmembers' outward QSL cards. This is still a lot cheaper than by mail.

The VK3 bureau, over the last three years, has handled approximately 410,000 inward cards and 320,000 outward cards. There is a total of 30,000 cards still uncollected at the bureau, and to remedy this, Inward QSL Manager Barbara Grey VK3BYK has tried for two years to contact all of their owners. Of the very few who bothered to reply, the comment was the same: "We don't want the cards; either send them back or destroy them."

These cards have now been sorted into alphabetical order by the Ballarat Radio Club and will be filed at the WIA club rooms for a further twelve months. If not collected by then, they will be sent back to the original sender with a notation on them stating that this person does not QSL.

Our Bad Apples

For example, one VK3 two-letter callsign has been heard on air saying, "I will QSL," but this station has over 500 QSL cards uncollected in the bureau. He quite blatantly states that he doesn't want them. A case of one bad apple giving the whole box a bad name.

A recent article in one of our local radio magazines reported a request to the Federal Bureau of the WIA by a licensed member of the WIA to either destroy or send back cards sent to his XYL—also an amateur but not a member of the WIA. The intimation is that she will receive cards direct only with the appropriate green stamps or IRCs for return of cards.

While I can sympathize with her as, being a semi-rare YL DX station, her cards must be in the thousands per year and be a drain on her household budget, I can also sympathize with those countries who have amateurs on very low incomes who cannot afford to get green stamps or IRCs to send for direct QSLs and must use the cheapest method available, the bureau, to confirm a new YL country.

So I would suggest that if you receive one of your cards back marked as a non-QSLer, don't blame all of us, just contact the offending station again on air and give them a good idea of what you think of people who say they will QSL but don't; they are damaging the image of all VK amateurs by their inconsiderate actions.

The SWL

While I have no grievance against the vast majority of SWLs, I do object to receiving cards back to me via the bureau from an SWL listing a three-year-old contact with a station that perhaps lasted only one minute with "via the bureau" crossed out and a request for a card "direct to PO Box so and so." No way is a card going back direct to that station—not with the cost of direct QSLing these days.

One of the last batches of QSL cards by the bureau to me contained sixty cards. Thirty-five were SWLs of which three asked for direct QSL cards. Result: Thirty-two SWL cards went by the bureau, three went into the rubbish bin.

No Log Required

The request by an SWL for confirmation of a contact with a station is going to be even harder in future because as of late 1983, the Department of Communications granted us the privilege of not having to keep log books except in the cases of emergency situations, club stations, or when directed to do so by the DOC.

This puts us in a Catch-22 situation where if we don't log every station we work, we can receive a card from an SWL for a confirmation of a contact that we have worked, but not logged. What do we do? Enter every contact, just to satisfy the many SWL listeners? Not log them and send cards back with "Sorry, OM, not in the log," even when it was a good contact?

So, if working a VK station, this makes it more important than ever to ask for a QSL if you want a card, so that your callsign will be entered into the log book. Very few Australian amateurs object to a request for a QSL card to confirm a contact; it has been a common practice since the inception of amateur radio. However, I, for one, do not enter all my contacts. Unless a QSL is asked for during the contact, I assume a card is not required. It is only a common courtesy to ask, and, if not in the log, no card.

Who is in the wrong? Am I, for not logging you, or, you, for not asking, "Do you QSL?"

Are You at Fault?

Going by the above, we do have some problems, but some overseas amateurs requiring a QSL card also have contributed to them by not doing the right thing when sending their cards. I will mention some of the problems we are having over here with your cards.

- Incorrect callsign on the cards; for example, VK3E--. The VK3 bureau has a lot of cards addressed this way. Probably a VK2E-- was meant since no E suffix has as yet been issued in VK3.
- How do you make your "V" in VK? The bureaus are getting a lot of cards that can be either VK3 or UK3. Much time can be lost by the unpaid QSL managers trying to sort out the problem. How many of your VK cards are at PO Box 88, Moscow?
- Undecipherable scrawls or hieroglyphics for the callsign that might look great on ancient parchments make the job of the person sorting thousands of cards at a time much harder. So please print callsigns in clear, precise letters and make sure you get your contact's callsign correct. With some of our current suffixes starting with phonetically similar letters (B–C–D–E–P–V), it pays to double check.

I notice in the listing of VHF contacts by the *Columbia* a contact with VK2PMN. I don't see how that can be as the P suffix denotes a Novice operator who, as such, cannot operate above 30 MHz. Was this a typical suffix mistake that also is being reflected by cards coming into our bureau?

However, let me state here and now that VK is not the only country with QSL problems!

Only 65% Card Return

In 1978, with the 10m band wide open virtually 24 hours a day, I had great fun with a 6-element cubical quad, working all around the world at all hours of the day and night and averaging 600 contacts per month. Most of these were QSL via the bureau. Checking the logs for that year, in 1981, I was surprised at the blank spots still in the QSL-returned column. It worked out at only a 65% return of cards.

Taking the price of QSL cards into account, that worked out at a yearly loss of around US$200 for non-returned cards. Needless to say, my QSLing became more selective, to the point that now I QSL only on receipt of a card, either direct or by the bureau.

Pirates

Are you sure you are actually working a licensed amateur? The ease with which anybody can buy amateur transceivers over here, with no questions asked, is not funny. It is soon to be stopped (we hope!). With today's large sale of CB rigs able to operate in the 28-MHz band plus an abundance of articles telling you how to convert the older CB sets to 28 MHz, it would pay you to make double sure that you are indeed working a licensed amateur. We do, like a few other countries, have our pirates.

One classic example involves the genuine call of Art Cooledge VK@AC. There are over 200 cards in the bureau for a person calling himself Bob and using this call. These cards will be going back to the sender, as Bob was a pirate. There are many other cards at the bureau that are, also quite obviously, from pirate operators.

Another case in point happened last year in VK3. Direct QSL cards were arriving at the home of an SK for contacts with him months after he died. As his wife was still living at the *Callbook* address, you will understand that this was upsetting her quite a bit. As her husband had a two-letter call and these are much sought after by other amateurs, her problems were solved by issuing her deceased husband's call to another licensed amateur to reactivate. As this particular amateur was well known on air, anybody else using his new reissued call would be easily detected.

This change of call in VK is accomplished by a simple procedure. When an amateur becomes a silent key, his callsign cannot be reissued for a period of two years. However, if a member of his close family requires the callsign, it will either be reserved or reissued to them. If the family does not wish to keep the callsign, it is possible for another amateur to get written consent from the closest relative to the deceased to take up his old callsign before the two-year period expires.

This gives you another problem with QSLing, as, in the above case, it is possible to have two owners of the same callsign only a few months apart.

So, if the station you are working says his QTH is near Melbourne, for instance, ask him his exact location, then look in a late *Callbook* to confirm his name and location before sending off that QSL card. I reiterate: Use a *late Callbook* because a lot of the two- and three-letter callsigns have been reissued over the last few years.

Direct QSLing

Speaking of direct QSLing, although Australia is called "The Lucky Country," not all of us are millionaires. You will find the usual cross section of the population involved in amateur radio, including students, pensioners, handicapped operators living on an invalid's pension, young marrieds with the usual mortgages and rearing children, etc. All of these people face the

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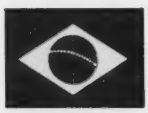
common problem: The cost of QSL cards can be a noticeable drain on meager finances. Add to this the practice of some overseas operators who send unexpected cards direct airmail with no return postage included and request a card back the same way, which happens quite often, and we can be in a dilemma as to what to do. A letter to Europe airmail is A$.85 plus card and envelope. It works out at around US$1.00 per letter, and it is not much cheaper sending it by surface mail. One week I had five of these letters.

Do I pay US$5.00 out of my own pocket just to confirm contacts with a country they have probably worked many times before? Do I instead send the card back by the bureau, knowing it might take two years to reach them or that they may never get their card if they are not a member of their local bureau? The result of the latter could be more overseas amateurs saying that the VKs are lousy QSLers.

While this is not the full story of QSL problems, I hope it will partly explain that it is not all our fault and that where we are at fault we are trying to remedy the situation as quickly as possible.

The rest is up to you.



BRAZIL

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Ivete Alves Monaco PY2ADI
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As Public Relations Chairman for Grupo CWSP, I would like to announce two awards.

Our CWSP Award is for all amateurs who have worked five members of our group (CW only) with valid contacts after October 15, 1976. Submit a list certified by an official radio club, with suffixes in alphabetical order, date, band, and report. (SWLs same rules.) Do not send cards. Fee, 10 IRCs. For endorsements (one for each ten PY2s up through 60), send one IRC and an SAE.

CWSP members are PY1DG and PY2s AC, ACH, ADI, AES, APE, ARX, ASI, ATL, BTR, BWD, BZD, CAR, CJW, CMS, CPU, CZX, DCP, DHP, DML, DRP, DY, EGM, EMM, FEO, FT, FWR, FWT, GCW, GPA, IAP, ICN, IEJ, JN, OE, RAN, RVO, SI, SPA, SUB, SV, SZA, TO, TR, TRD, TUO, UZV, WG, WR, and XB.

The Brazil CW Award (BRCW) is issued by us for any radio-amateur stations working at least 15 different Brazilian states and territories from Brazil, *which stations already have earned all 6 endorsements for the CWSP Award.*

de PY2ADI

BRAZILIAN PPC MEMBERS AND COUNTRIES AWARD

As a special celebration during PPC's 20th year (March, 1984 to March, 1985), this oldest Brazilian CW group has just announced the PPCMC Award (CW mode only). It's a tribute to radio amateurs of all parts and to those who give their best towards CW development. The PPCMC Award combines all countries (ARRL list) and PPC members. QSOs must have been made on and after January 1, 1980.

Issued by the Brazilian Picapau Carioca Group, this award is available to all radio amateurs as a permanent competition.

Each ARRL country and each PPC member counts 1 point, only once, no matter which band, two-way QSO.

Basic Award—Two-way QSOs completing 50 points, involving at least 40 different countries.

Endorsements—Two endorsements, 25 points each, until 100 points; from 100 points to 150 points, 5 endorsements, 10 points each; from 150 points on, endorsements at any requested quantity, at will.

Honor Roll—Those reaching 200 points.

No QSLs needed. Send list (GCR) in suffix alphabetical order showing full details of QSL, verified and certified by a recognized amateur-radio society. Fee for the basic award is 5 IRCs accompanying applicant's QSL card with complete QTH information. For endorsements, send SAE and 1 IRC. Address PPC Certificate Manager, PO Box 2673, 20001 Rio de Janeiro RJ, Brazil.

de PY1CC

CHILE

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Chile

WORLD'S HIGHEST 2M REPEATER

For those of you who read our article in the June, 1983, issue of *73*, it may be of interest to know that the 2-meter repeater installed on the top of El Plomo mountain at 5,500 meters above sea level worked perfectly for about 4 months until the antenna broke down due to the heavy winter winds. Nevertheless, the repeater system continued to work (although the signal was extremely low) during all the winter season, and the repeater and solar panels suffered no damage.

Last summer, a group of hams climbed again to the top and repaired the antenna damage, replacing the old antenna with a very light and flexible whip which we hope will survive the coming winters.

By the way, we would like to hear from other hams around the world, just to know if our repeater is still the highest.

WACE AWARD

Radio Club de Chile continues to issue its WACE Award to all hams who send proof of contacts with each of the 10 Chilean zones. More details and information can be obtained by writing directly to: Awards Manager, Radio Club de Chile, Casilla 13630, Santiago de Chile.

RECIPROCAL LICENSING

During our summer months especially, many hams from various parts of the world visit Chile and make use of our reciprocal license agreements. In fact, Chile has official agreements with the following countries: Argentina, Brazil, Canada, Colombia, Ecuador, Israel, Uruguay, and the USA. Nonofficial but equally good treatment has also been given to hams from the Federal Republic of Germany, England, Panama, Spain, and Japan.

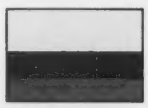
Chile is known for its skiing facilities during our winter months and for its trout fishing during summer on its many lakes and rivers south of Santiago.

During the past summer season, we enjoyed the visits, among others, of DK2BI, DK9WB, and DK6HH, who were here during early March, and also Lloyd and Iris Colvin of world fame, who at the time this is being written are still enjoying lobsters and DXing on Juan Fernandez Island. They also visited Easter Island for about 2 weeks and were able to make over 8,000 contacts during their stay on the island of the mysterious Mohais. We are sure that they will always remember their visit to CE land.

Patricio CE3GN (far right) and his wife, Ana Maria (center), with Lloyd and Iris Colvin, enjoying a barbeque at Patricio's QTH just before leaving for CE0Z.

COLUMBIA

Much has been written about Dr. Owen Garriott's flight and contacts from *Columbia*. Nevertheless, we would like to repeat the fact that only 2 South Americans were able to make it. The nice thing about it is that both of them are Chileans! Our congratulations go to Andres CE2AHD and Ignacio CE3CKE, who appeared on the official list of contacts.



COLOMBIA

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Colombia

COLOMBIAN INDEPENDENCE CONTEST

The Colombian Radio Amateur League (LCRA), founded in 1933, will sponsor the CID 1984 Contest, running from Saturday, July 21, at 0000 GMT till Sunday, July 22, at 2300 GMT.

The Colombian Independence CW and Voice Contest will include the A category: single operator/single band, voice only, CW only, or mixed; B category: single operator/multi-band, either voice or CW only or mixed; C category: multi-operator but with single station, multi-band voice, CW only, or mixed operation; and the D category: multi-operator, multi-transmitter, multi-band, either voice or CW only or mixed.

There is also a single-band category for operators using 14 MHz against those operating on 7 MHz, etc. The bands of operation will be 1.8, 3.5, 7, 14, 21, and 28 MHz. The contest call will be, for voice, "CQ HK CONTEST," and for CW, "CQ HK TEST."

The QSO exchange for non-HK stations for voice will be composed of the signal report followed by three (3) digits starting from 001. For CW, the exchange is the RST report plus three (3) digits beginning with 001 as in the voice modality.

For HK stations, there will be a special procedure which includes the signal report, the number 174 (indicating the 174th Colombian Independence anniversary celebration), and the QSO sequential number. The same will apply to the CW QSOs, namely, RST, the number 174, and the QSO number.

The scoring for non-HK stations will be: for working HK contest stations, five (5) points, working non-HK stations which are outside their own country, three (3) points, and working stations of their own countries, one (1) point.

For HK stations, working non-HK stations earns five (5) points and working other HK stations earns three (3) points only. For the combination of different countries contacted on each band as well as QSOs with different HK districts (there are 10) worked on each band, the usual multipliers will apply.

The total number of QSOs multiplied by the total of countries contacted and the different HK zones contacted in the different bands will give the definite numbers, the final score.

The log entries should include the time in UTC, callsign of station worked, report given, report received, multiplier, and the points corresponding to the QSO. Separate log sheets should be used for each band.

The multipliers should be indicated/applied only for the first QSO on each band. Finally, a summary sheet must be attached to each entry indicating the total points, category, name and address, list of operators in the case of multi-operator stations (if applicable), plus the usual contest declaration. The submissions not including a summary sheet will be considered only as check logs.

Sole conditions of entry for participation are that each participant should communicate with at least ten (10) HK stations on voice or five (5) HK stations on CW for acceptance by the Contest Committee and must submit written proof of a total of fifty (50) QSOs, ten (10) of them with HK stations on voice or five (5) on CW to qualify for any prize. Should the contester wish to work in the mixed category, he will need to contact only five (5) voice and five (5) CW HK stations. One contact per band with the same station is acceptable; cross-band or cross-mode QSOs are not valid.

Violation of the amateur-radio international as well as country's regulations or the contest rules, the lack of ethics, so-called "phantom QSOs," excessive duplications in the total number of QSOs—all will be reasons for disqualification by the

LCRA Executive Committee, and their decision will not be subject to appeal.

Logs should be mailed by August 30, 1984. Those received after December 30, 1984, will not be considered but will be gladly used as check logs. The entries must be addressed to: LCRA, Contests, Logs and Awards Department, PO Box 584, Bogota, Colombia, South America.

CYPRUS

Aris Kaponides 5B4JE
PO Box 1723
Limassol
Cyprus

NEWS FROM CYPRUS

On March 10, 1984, the Cyprus Amateur Radio Society (CARS) held its annual general meeting and a new central committee was elected: Totos Theodossiou 5B4AP, President; Aris Kaponides 5B4JE, General Secretary, and Pantelis Lytrides 5B4CF, General Treasurer. Members are Thanos Apostolides 5B4CR, Christoforos Demetriou 5B4EI, Sotos Miltiadou 5B4JX, Andreas Pavlides 5B3AC, George Kourtellis 5B4DY (Nicosia), Stelios Ioannou 5B4AH (Famagusta), Nicos Hadjimiltis 5B4CV (Limassol), Andreas Christolorou 5B4JR (Paphos), Erricos Lanitis 5B4GJ (Larnaca), Glafkos Kariolou 5B4MM (Kyrenia).

A new UHF repeater was bought by CARS and soon it will be operational. At the moment it is being tested by the repeater technical manager, 5B4AH, and then a suitable site will be found.

Cyprus was represented in the *CQ* WPX Contest by four stations: 5B4MF, 5B4ES, 5B4LP, and 5B4EP.

OM Andreas 5B4LP operated solely on 80m, and he claims that he has broken the continental record on this band. OM Marcos 5B4EP operated on 160m only with good results also. 5B4ES (the Nicosia English School club station) operated multi-operator/multi-band under the guidance of Dr. Larry Day 5B4LD.

During the last couple of months, the regular 5B4 DXers operated on all the HF bands. 5B4EP, during the mornings, was on 160m. On 80m, 5B4LP, 5B4MD, and 5B4JE were showing up most evenings, and on 40m, 5B4JE was working with a new delta loop antenna with the company of Roberto I2VRN (the strongest signal on this band from Europe). Also, several 5B4s were operating on 20m, 15m, and 10m. On the 10m FM mode, regular operators were 5B4MD, 5B4LP, 5B4MF, and 5B4JE.

Being a very small country with a handful of amateurs active on the bands, it is difficult to find news for publication, so I am going to describe some interesting amateurs on the island. Here is a short portrait of OM Nicos Hadjimiltis 5B4CV, who is also a neighbor and a very good friend of mine.

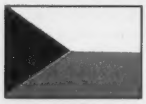
Nicos got his ticket in 1976; he is an engineer with a broadcasting station, specializing in antenna construction and erection.

Nicos 5B4CV (left) with visiting friend DF3MG.

5B4CV doing some antenna work.

Nicos has been operating regularly on all bands and modes. He is a great home constructor, and among his constructions are an HF linear, a couple of antenna tuners (one of which is remotely controlled), power supplies, a TV camera, and other gadgets. His latest project is a Robot 400 converter for SSTV.

His is the only station in Cyprus operating now on RTTY and SSTV. Nicos is also the president of the Limassol CARS group and is one of the main helpers in running the Limassol club station; he always is prompt to help fellow amateurs.



CZECHOSLOVAKIA

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Czechoslovakia

Miroslav Joachim OK1WI
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Czechoslovakia

Radio amateurs here, as of July, are licensed to work 1.8 and 10.1 MHz. On 1.8 MHz are those licensed for 15 W input maximum. 160 meters is divided by mode: CW on 1.81–1.90 MHz, and CW and SSB on 1.90–1.95 MHz. On 10.1 MHz are amateurs licensed to work CW and RTTY, with RTTY on the last 10 MHz of the band. As of January, 1985, 18.1 and 24.9 MHz will open.

Journal Funkamateur (number 7/1983) brought information about the USSR. In 33 thousand club stations are half a million having an interest in an amateur activity, with 2150 champions active on internal USSR QSOs and 58 champions active on International QSOs.

Number 8/1983 *Journal* reported results of the first SNERA competition in the USSR. (SNERA contributes to scientific perceptions of polar radiances and their influence on UHF.) The winner was UA3MBJ with 1716 points; second was UR2RQT with 1618 points; UR2RIW had 1239 points. The best club station was UK9CAM with 365 points, and one SWL, UA3-142-198, had 221 points.

Every year, at least one world record in the 10-GHz band is the aim of Nicola I0SNY, Perrugia, Italy. Last year, in July, Nicola was in the Ceuta (EA9) and was reached as callsign I0SNY/EA9, in location XV04c, by station IW0BCU/IT9, Sicily, in location GY64c, a distance of 1621 kilometers, for a world record in the 10-GHz band. Nicola repeated his contact with station I0NLK/IT9 of that same location. On the same day, three hours later at 1912 UTC, Nicola surmounted that world record by contacting station Pietro I0YLI/IE9 on Ustica Island (north of Sicily), location GY26b, a distance of 1663 kilometers.

Nicola also reached a new European record on 1296 MHz with his contact with station I8TUS/8. Operator Salvatore was worked in south Italy at location IZ41h. The distance was 1914 kilometers, beating the old European record of 1577 kilometers between OK2BFH/P and G3AUS on October 30, 1982.

Thanks for information and letters from W2HAE, W4NBZ, and WA0HWH, but I cannot send back letters—I am very QRL.

de RK, OK3KFO

MARCH, 1984

Traditionally, the month of March is devoted to the activities of YL operators in OK. This is in connection with the International Day of Women, March 8, celebrated in OK as well as in all socialist countries.

The March issue of *Amaterske Radio* (usually designated as *AR*) brings the story of the first YL operator in Czechoslovakia. She was Jarmila Hermanova from Telc in Moravia, and during the period 1929 to 1931, she worked under the callsign OK2AJ. The first Moravian hams, OK2AG and OK2AC, initiated her into amateur radio.

Daughter of the director of a local power plant, she was successful at the exam in 1931 and was offered a bouquet of roses by the president of the examination commission (Ministry of P and T), Dr. Burda. In 1933, her callsign was changed to OK1YL. Her equipment was confiscated on March 18, 1939, during the Nazi occupation. She passed away in 1971, in Zirovnice.

The *Radio Amateur's Messenger* for February, 1984, brings more news concerning YL operators. In fact, since the end of 1983, Jozina Zahoutova OK1FDL has been the president of the Central Radio Club. Her husband and their two children are also active hams. They live in Pribram. Let me here send best wishes of peace and happiness to all YL ops from OK land, where we have grown from one YL in 1929 to over 150 today.

de OK1WI

DOMINICAN REPUBLIC

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Santo Domingo
Dominican Republic

THE TWINS AGAIN

Radio Club Dominicano has just elected a new directing board headed by Cesar Dessangles HI8CQ, twin brother of Ernesto HI8CW (former RCD president in 1977). They are the sons of Roberto Dessangles HI8RD who was himself president in 1976.

The great work done by the twins in 1976 helping their father, and then in 1977 during Ernesto's presidency, makes us anticipate a successful performance in 1984.

The advantage of the twins, when either one of them occupies the presidency, is that RCD really has two presidents in one, sharing the work and keeping the club and its membership constantly progressive.

Anyone who doesn't know them well will find it difficult to tell one from the other—and there you can be talking to the wrong one, who's not the president, to deal with some club subject, but it doesn't matter...since either will do. Nevertheless, if you want to make sure, just lift up his shirt and you'll find on Cesar's abdomen a scar that Ernesto doesn't have.

The twins are popular in Dominican ham radio, and when they stay away from radio equipment, it's just due to their professional work as architect-engineers which occasionally takes them to other cities around the island.

Just as in 1976–77 the Dessangles' directing board developed a team working plan that was remarkable, a replay is now expected, with the help of the other members of the board and of all the membership in Radio Club Dominicano, Inc.—the most prestigious institution of Dominican Republic ham radio.

Other board members are Eduardo Hued HI8EJH, vice-president; Charlie Catheline HI8CCB, secretary; Tony Lake HI8GAL, treasurer; and Waldo Pons HI8WPC, Wil-

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AM-341

From left to right: Cesar HI8CQ, Tim HI8MFP, and Ernesto HI8CW.

liam Read HI8WRE, Frank Caraballo HI8FCN, Osvaldo Castillo HI8OCB, and Winston Vargas HI8KW.

Immediate plans are for the contests of the Republic Restoration and the Radio Club Dominicano Anniversary. Dates will be given in the near future, as well as information on CW classes and equipment operation procedures for new ham-radio operators.

The twins and the board would like to set up new antennas for the club, organize a work laboratory, and, of course, as a well-established tradition, organize the popular DXpeditions to Saona Island in zone HI2, which always gives rise to much activity and great fun.

I want to thank our readers for all the letters and notes on the *73* international section. I have answered them personally, trying to help them out.

Soon I hope to have an interesting column about the important reasons why HI QSLs are either not getting here on time or just don't get here at all!

FEDERAL REPUBLIC OF GERMANY

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QCWA IN DL

In April, 1983, the managing board of the Quarter Century Wireless Association (QCWA) elected Jean Wolff LX1JW to be a member of the Hall of Fame. Jean is the fourth QCWA member and the first European to be thus honored. One has to consider that only one member out of 10,000 QCWAers is chosen per year. For the German chapter and all the radio amateurs in Europe, a very good success.

Together with OOTC, SOWP, and the promoting association, "Foerderverein Amateurfunkmuseum e.V." (Society for Promotion of an Amateur-Radio Museum), we managed a stand at the "Ham Radio 1983" (largest national amateur-radio fair) in Friedrichshafen/Bodensee. Many visitors showed great interest in our stand and did quite a lot of eyeball QSOs. Saturday night, our meeting took place in the administration building. We met again a week later, June 24, 1983, in Waldrach, in the area of Trier, and on Sunday we had an enjoyable trip to Luxembourg, including a sightseeing tour, LX1JW being our tour guide.

After the sightseeing, we drank a bit of champagne with LX1JW in his QTH—about 100 people were participating in this "small" party. We were very interested in the station equipment and admired the 21 antennas. After having a nice lunch and after a visit to a wine coop, we took a beautiful trip on a steamship on the Moselle under excellent weather conditions. We returned to Waldrach and spent the evening with interesting conversations.

Our guests from the USA were: Charles W4SVB with his XYL Peg, Bill KD4ZY with his XYL from Chapter 107, Gene W5EJT, with his XYL Ruth, and K5OPT from Chapter 37. W4SVB presented to the German chapter a nice plaque from Chapter 107. After a sightseeing tour to Trier the next day, we returned to our homes.

On September 6, 1983, about 25 amateurs and their XYLs met at the QTH of DL7AC. LX1JW was honored to receive a plaque from W5KL, vice-president of QCWA. The event was recorded by the broadcast station, "Deutschlandfunk." Later we did QSY to a restaurant, where we spent the whole night.

When the vote to the QCWA board in the USA took place, DL3ME was reelected as director. Out of 15 directors, he was voted into the 4th position. The votes in the German chapter are also finished. The previous managing board was confirmed. The German chapter now starts its seventh year.

70-CM MOONBOUNCE (EME)

On June 13, 1964, just 20 years ago, a group of radio amateurs around HB9RG happened to do the very first 70-cm transatlantic QSO with KP4. The 1000-foot parabolic reflector, gain at 70-cm, 50 dB, which was used by KP4BPZ, had led to this spectacular success. The group (DL9GU, DL3NQ, DJ4AU, DJ3EN) utilized "only" 500 Watts rf, a 5m dish, and an rx with tubes (7 dB). The signals: gain up to 15 dB signal-to-noise ratio. For the group this surely was a great success.

One year later, on July 3, 1965, DJ4AU with his 80-element group antenna, rx input with EC88 and 4CX250 PA—was capable of exchanging 559 reports via the moon with KP4BPZ. Also the first SSB QSOs were worked. Such well-known calls as DL3YBA (4 x 22-element yagis) participated in this action.

On July 24, 1965, KP4BPZ was worked again in CW and SSB by DL stations DL6IQ and DL1EI. Here the equipment was relatively simple also—a 36-element group, rx input with 416B and "only" 200 Watts rf.

Some years have passed now, and with better receivers (GaAsFET) it has become quite a lot easier working EME successfully on 432 MHz. Nowadays, almost 20 radio amateurs in DL are active in this mode. In 1983, the opportunity existed for almost everybody to work via moonbounce.

Radio astronomy was "born" back in 1933, on April 27. Working with international radio communications, Karl Jansky (1905–1950) found a disturbing noise received by the experimental antenna. Jansky came to the conclusion that this noise came from space. The radio emissions of our Milky Way system were discovered. In memory of Janksy, the president of AMSAT-USA, W3IMI, and K8HUH put into operation an antenna of the Greenbank Radio Telescope on 432-MHz EME. After a short echo test, the first station was reached on May 13, 1983—DJ9DL in CW with a 559 report at 1910 UTC. This was followed by DF7VX at 1950 UTC, also with 559 on both sides.

For Europe the moon now set, and the next QSO in DL took place on May 14. Jan DL9KR exchanged 57 in SSB with K8HUH at 1202 UTC. Then the QSOs increased rapidly: 1240—DJ8QL 559/579 in CW, 1300—DF9CY 449/449, 1334—DF3RU 559/579, 1344—DF0AS 55/56 in SSB, 1347—DJ5VI 55/57, 1355—DL6NAA 55/55, 1506—DC9RH 44/44, 1653—DJ6MB 559/559 in CW, 1658—DF7KB 559/559 (his very first EME QSO), 1920—DL1BP 43/53 in SSB, 2017—DJ7YP R0/R0. On May 15, DF9CY started at 1330 with 449/559, DL6WU at 1432 with 449/469, and DL9KR made an SSB demonstration for visitors at K8HUH around 1450. Then, 1616—DK5AI 549/559 in CW, 1710—DK1PZ 449/449, 1723—DL2CJ 449/449, 2037—DK3YC 339/419, 2109—DF3EE 549/419, and for the last DL station, DJ9BV 239/R0.

In this list some well-known calls are missing, but on the other side, some amateurs worked their first EME QSO with relatively simple equipment. DF3EE: only 4 antennas and 250 Watts, DJ7UP: a 21-element Tonna and 400 Watts rf, and JA@CC: 4 antennas and only 40 Watts.

It was suggested that the information about the NRAO-K8HUH 432 EME test was received only by insiders. Otherwise, certainly much more activity would have taken place. The station equipment of K8HUH, a mirror of the interferometer with a diameter of 43 meters and a wideband cross dipole (250–500 MHz) in the focus of the mirror, was used for antennas. The focus is located 18m away from the mirror itself. Also, the 150-Watt transistorized PA and the GaAsFET preamplifier are installed here; these were controlled by different sets, such as MM432/28, IC451, IC720, or Drake R4B. Their own echoes had been heard 59.

In the time period of May 13 to 16, 1983, 132 different stations were worked in 250 QSOs. One time Africa, 6 times Asia, 67 times Europe, 54 times North America, 1 time South America, and 3 times Oceania. Besides, the "WAC 432 MHz" could be worked during these 35 hours.

OJ0MA IN RTTY

Market Reef was QRV in RTTY for several days in June, 1983. OP Kee OH0NA reported: Maerkets Fyr (Market Reef) is situated in the Baltic Sea between Sweden and the Aland Islands. The reef measures about 85 by 310 meters and is about 3 meters above sea level. Three "cottages" were placed on the bare rock: a depository for wood and oil, another for engines and tanks for oil and gas, and finally a small house with six rooms and a kitchen.

That year (1983) the station consisted of a Drake TR-7/RV-7, an Alpha 374, and a "Telereader." Antennas used: a TH3MK3 for 20 meters on a 15m-high, solid-concrete mast, a 2-element beam for 40m, dipoles for 80 and 160m, and a GPA for 40/20/15 and 10 meters.

Some hints now for ops and visitors to Market Reef: Every licensed visitor can get a transmitting permission if the "Alands Lotsfoerdelning" (pilotage service) agrees with the tour to Market Reef. This agreement includes the providing of food. It's only a 25-kilometer trip between Aland and the Reef, but sometimes it's very hard to land on the rocky coast. Last year we had to wait 4 days to come through; this time it was OK the first day. If you want further information, please contact Karl-Erik Eriksson, SF-22430 Saltvik, Finland. That's the QSL address, too.

de DJ8BT

ATOMIC CLOCKS

Can you think of a moderately-priced clock in your ham shack which shows local time accurate to 1 ms, date and day of the week, and which automatically adapts to the changes of summer/winter time and leap years? Which synchronizes itself within 2 minutes after a power break? And which has a long-term stability of 1 second in 300,000 years?

This is no dream for German radio amateurs anymore since a whole range of appropriate clocks is on the market. Prices range from 300–400 DM (115–150 US dollars) for complete units. Examples are the Renkforce atomic-clock system ACS-77, the DCF77 atomic clock made by Schwille-Elektronik (PO Box 801609, 8000 Muenchen 80), and the Hopf atomic clock 4300 (distributed by Conrad Elektronik, PO Box 1180, 8452 Hirschau).

In addition, the radio amateur can take advantage of another feature of these clocks. All of them have a receiver which picks up the required time signals on a frequency of 77.5 kHz. This transmission is controlled by the Physikalisch Technische Bundesanstalt in Braunschweig, Germany, which is an institution comparable to the National Bureau of Standards in other countries. The emission on 77.5 kHz has a frequency stability of 0.001 ppm within a period of 10 seconds and a much higher stability on the order of 0.000001 ppm for extended periods of time.

It is relatively easy to synchronize a 10-MHz crystal oscillator with this 77.5-kHz signal. Tests have shown that by this technique, a low-cost 10-MHz reference frequency signal can be generated with an accuracy of at least 0.001 ppm. It can be used as a solid basis for accurate frequency synthesizers, for frequency dividers to be used for transceiver calibration, for the synchronization of the crystal oscillator in frequency counters to improve their accuracy and long-term stability, and for numerous other applications. (Construction articles for the DCF77-controlled clock appeared in Reference 1 below and for a DCF77-controlled 10-MHz frequency standard in Reference 2.)

All these features are made possible by a special service of the PTB. According to the definition that 1 second equals 9,192,631,770 periods of a specific radiation of the nucleons of 133Cs, PTB utilizes this standard in its atomic clock CS1, which generates highly accurate time and frequency signals. The time signals are encoded and transmitted by station DCF77 near Frankfurt/Main on 77.5 kHz. Both the time signals and the transmitter frequency are controlled by CS1. The transmission of

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TEN-TEC

DCF77 can be heard in an area of about 600 kilometers around Frankfurt/Main, i.e., in most parts of Germany.

The signals of DCF77 can be picked up by a simple loop or ferrite antenna. After filtering and amplification, they are decoded to obtain the date and time information which can be displayed. Furthermore, the carrier of DCF77 can be amplified and utilized directly to synchronize other signal generators as discussed earlier. If DCF77 cannot be heard, a very similar but more commonly-available technique to produce precise reference signals on the basis of AM broadcast transmissions is described in Reference 3.

The German radio amateurs are only a small but nevertheless grateful portion of all consumers of the DCF77 time and frequency signals. In the meantime, PTB controls by means of DCF77 the clocks and transmission frequencies of broadcast and TV stations, the time announcements on the telephone, the clocks of railway stations, and meteorological services, to name a few. Altogether, the atomic clock and the time and frequency signals derived from it play an important but often unnoticed role in the lives of almost everyone here. For ham radio, however, I think it is a particular challenge to make even better use of it in the future.

de DJ3NW

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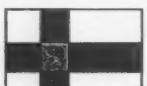

FINLAND

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Finland

Location NW19 H, Kuopio—not exactly in the middle of the world but almost in the middle of Finland—is the spot where the 25th summer happening of the Finnish Radio Amateurs Association, HAMSSI 84, will take place July 19–22, 1984. The happening will be organized by Kuopion Seitoset, the local club for radio amateurs—which will be 30 years old this year.

HAMSSI 84 will be a happening for the whole family, and the organizers are expecting participants from several countries. The program consists of, among other things, the Nordic Championship of radio orientation, pileup contest, a photograph exhibition which is composed of the harvest of a contest on the subject "Radio Amateurs," lectures on various subjects such as "Satellites and Radio Amateurs," DX dinner, YL meeting, old-timers meeting, and the biggest flea market in Finland. The members of the family have also been taken into consideration by arranging a cruise by ship, city sight-seeing tours, and, especially for children, there are puppet shows, pony riding, games, and playing. A detailed program will be sent when requested.

The event will take place in Rauhalahti, an area which is situated only 5 km to the south of the center of Kuopio. In the area there is a new modern camping site with beaches and saunas on the shore of Lake Kallavesi, a high-class hotel, and a group of buildings belonging to a mansion which will serve as the center of the whole summer event.

The town of Kuopio is situated in the largest lake district of Europe. There are 76,000 inhabitants in the town, which is the center of tourism, administration, and culture for the whole eastern part of Finland. There are lots of things to see and experience in Kuopio. The beating heart of Kuopio is the marketplace—a lively meeting place of international tourism. There are five interesting museums in the town; the Finnish Orthodox Church Museum is the only one of its kind in western Europe. There are eleven hotels, two summer hotels, and two youth hostels in Kuopio. The town also is the center of Finnish inlake boat traffic: There are eight passenger ships departing from the harbor of Kuopio daily. Everyone surely can find something to his taste!

Radio amateurs throughout the world now have, within the framework of their hobby, an excellent opportunity to come to Finland to take part in an international camp. It is organized in the middle of summer when Finnish nature is at its best: The sun hardly sets during the nighttime, the district is, to a great extent, uninhabited, the tens of thousands of lakes inveigle you into cruising, and the green forests invite you to rove on paths. You have an excellent opportunity to get yourself acquainted with this beautiful Scandinavian country, its capital, Helsinki, and the hills of Lapland to the north of the Arctic circle, before or after the camp.

The boat and flight connections from Europe to Finland are good. Those participants who are coming from further away are advised to collect small groups and make use of the advantageous group prices of the airway companies. Contact your own club in order to be able to come to Kuopio. There is room at the camping site, but it is wise to make all other reservations for accommodation, as well as the reservations for flights and ships, in good time.

Hamconvention topics and activities will include Operating VHF/UHF in Modern Environments, Towards Gigahertz, Antennas, DX Operations Today, a Contest Forum, SSTV/ATV/RTTY, the DX Dinner, Nordic and Finnish Championship in Foxhunting and YOU too, CW competition: Amateurs against Defense Forces, Police, and Association of Finnish Radio Telegraphists, Electric Security in Ham Radio, New Technology used in Ham-Radio Equipment, and Amateurs and the Microcomputer.

We have a foreign-visitor manager who will be very glad to help and guide you during your visit to HAMSSI 84, and main topics will be interpreted in English.

Kuopio is about 450 km northeast of Helsinki with good rail, road, and air connections. Accommodations can be arranged at the first-class Rauhalahti hotel or the campsite nearby. The Rauhalahti campsite is situated about 5 km from the center of the town. It is modern and well equipped: cafe, kiosk, beach, 4 saunas, rowing boats, modern shower and washrooms, and parking areas for cars and caravans.

Campsite reservation: Kuopio Tourist Service, Haapaniemenkatu 17, SF 70100 Kuopio, Finland, Tel. +358-71-114101, Telex 42163 ktour sf.

Hotel reservation (preferably before May 30, 1984): Hotel Rauhalahti, Katiskaniementie 2, SF 70700 Kuopio, Finland, Tel. +358-71-311700, Telex 42242 rauha sf.

Further information: Mr. Joxa Hartikainen, OH 7 00, Kauppakatu 45, SF 70100 Kuopio, Finland, Tel. +358-71-124311, Telex 42138 carls sf.

GREAT BRITAIN

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One of the most rewarding spin-offs from writing a column such as this is the receipt of letters and cards from readers. Since writing for *73*, I have received all sorts of requests and snippets of information not only from readers in the United States, but also from Africa, Asia, and Australia. Usually I try to put together a personal reply and write directly to the correspondent. A recent QSL card, however, prompted me to put together this particular column.

Ron Johnson WA5RON of Silver Creek, Texas, wrote asking for information about our 4-meter (70-MHz) allocation. I had not previously used this as a topic because I did not think anyone would be interested in a VHF band to which they did not have access. Ron's letter, though, suggested that US hams would find details of 4 meters of interest and he asked a number of pertinent questions.

The 4-meter band is spelled out in the UK license as follows. The band coverage is 70.025–70.5 MHz with usage being on a secondary basis (some military systems use 70 MHz and have priority at all times). The maximum allowable power is 50 Watts dc input (or, in Department of Trade and Industry terminology, "133.33 Watts Radio Frequency Peak Envelope Power").

Allowable modes on 4 meters are AM (including CW, of course), SSB, and FM. Although 70 MHz is classed as a VHF band, only class A license holders have access. VHF-only class B licensees (i.e., those who have not passed a code test) cannot use any band below 144 MHz. Needless to say, this restriction is viewed by some as rather pointless—its major impact is to reduce the number of potential users of the band.

As with all VHF bands in IARU Region One (Europe and Africa), there is a band plan for use of 4 meters (like the others, it is a voluntary plan but, nevertheless, is mostly adhered to). The plan seeks to separate the non-compatible modes (i.e., SSB and FM) whilst giving everyone a fair share of the available spectrum.

The 4-meter band plan is as follows:
70.025—Beacons only
70.075—CW only
70.150—SSB and CW only
70.200—SBB calling
70.260—All modes
70.300—RTTY calling
70.400—FM simplex
70.450—FM calling
70.500—end of band

Current 70-MHz beacons with power and beam heading are:
GB3CTC (70.300)—40 W, 45°
GB3WHA (70.040)—16 W, 315°
GB3BUX (70.080)—20 W, Omni
GB3ANG (70.060)—100 W, 160°

There are currently no repeaters operating in the 70-MHz band.

There are only two other countries with allocations in the 4-meter region. These are Gibraltar (ZB2) and Eire (EI). The opportunities for DX are correspondingly rare, therefore, although there have been reports of crossband contacts (70/144 MHz, 70/28 MHz, and, recently, 70/50 MHz) with Faroes (TF), Madeira (CT2), and Sweden (SM).

Despite low occupancy rates, 70 MHz does boast some of the less usual propagation modes with meteor scatter, auroral, and sporadic-E all featuring. Incidentally, the record distance for the last-mentioned mode is 745 km. Sporadic-E is also responsible for the frequent appearance in the UK of beacons ZB2VHF and EI4RFF (70.130 MHz).

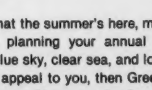
Perhaps the most endearing feature of the 4-meter band is its quietness and lack of crowding relative to 2 meters. This also can mean long periods when CQ calls remain unanswered.

There is little commercial equipment available for 70 MHz, with those few advertised items being of UK origin. (I have never seen any Japanese 4-meter gear advertised). Metalfayre of Dover produces 4-meter antennas with a 3-element version (7 dB gain) available at $40.00 and a 5-element version (9 dB gain) available at $64.00.

Wood and Douglas produces a range of 70-MHz modules that can form the basis of a home-brew rig. These include a 1.5-W transmitter ($50.00 assembled, $30.00 kit), an FM receiver ($90.00 assembled, $62.00 kit), and a couple of preamplifiers.

It is unlikely that 4-meter occupancy will increase significantly until the band is opened to class B license holders or more countries adopt an allocation in this part of the spectrum. Neither of these seems likely at present.

An interesting aside has just come to my attention via the RSGB hotline news service (a telephone answering machine at RSGB headquarters). British Telecom has just closed down its cable television service in Milton Keynes because they were unable to prevent egress of a 144-MHz signal. The Department of Trade and Industry will not permit the service to reopen until a new carrier frequency is implemented. Well, well!



GREECE

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Now that the summer's here, maybe it is time for planning your annual vacation. Well, if blue sky, clear sea, and long sandy beaches appeal to you, then Greece is the place for you. You may also keep in mind that Greece has a lot to offer to a radio amateur, such as four separate DXCC countries to work from. These countries are mainland Greece (SV), Crete (SV9), Dodecanese Islands (SV5), and Mt. Athos (SV/A). Even if we have to leave the last one (hard to obtain a license), there are still the three to work from.

Things are much better now than they used to be a few years ago, and people have started to understand a bit more about amateur radio. There are many places such as hotels, bungalows, etc., where the owners allow an antenna to be erected and also will provide any help needed. I remember once, four years ago, while on vacation on the island of Cos (Dodecanese Islands), two people were fighting about who would have the privilege of having our antenna on top of his house!

So, do consider Greece as a possible place for your next vacation and don't forget to bring along your amateur gear, un-

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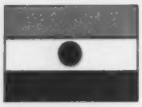
By the way, don't be surprised if you hear on the air a J4 prefix instead of the regular SV. Greece is issuing this prefix on special occasions, like contests, celebrations, etc.

Finally, we have two more countries that now have a reciprocal agreement with Greece. These are Sweden and the Federal Republic of Germany which, along with Cyprus, the USA, and Canada, make a total of five.



INDIA

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Madras 600 006
India

THE GOLD RUSH

DXpeditions still pay—especially when they are next door. DXpeditions have always had their own special kind of charm—not just the spirit of adventure, but also the fragrance of greenbacks. With a large number of affluent amateurs looking for more contacts to complete their single-band/multiband DXCC, a number of standardized methods to promote DXpeditions have evolved over the past two decades.

It began with the loan of equipment, money, and manpower to the local amateurs. One or two of the sponsors, mainly from the US, would try to join in as members, although the leader would be an Indian. The beams were given as a gift after the event because they would cost more than their original cost to take back. The QSL manager to the expedition was generally one of the sponsors—so that's where the greenbacks ultimately landed.

With the natives getting wiser, they began organizing their own expeditions with equipment donated by foreign sponsoring groups. The ostensible purpose was to give the world contacts with a rare country. The resulting greenbacks now came into their hands and mostly covered their costs, but did not compensate for all the backaches and tribulations of the travel.

The latest revolution in equipment design has now made it possible for expeditions to be more cost-effective by making multiband/multi-operator, round-the-clock operation possible with simple hand-carried power sources. Indians have not been too slow in catching up with this advantage.

Two regions of India that have enjoyed separate country status for quite a long time are the Andaman-Nicobar Islands and the Laccadive Islands. They have always been targets for these promoters. And, luckily for country-hunters, that status has continued long after these islands became integral parts of VU-land. There was a move to do away with special callsigns for these areas, but the Federation of Amateur Radio Societies of India (FARSI) President M. V. Chauhan VU2MV pointed out to the government the need to continue special callsigns for these areas—advice which obviously was heeded.

Late in 1983, with barely a few weeks to go, the government decided to celebrate WCY with a general permission to all comers to operate for a 15-day period up to December 31, 1983, from the Laccadive Islands, 250 miles off the west coast of India. Every station would use VU7WCY suffixed by his own call letters. The first team of two men and a YL left promptly and claimed over 5000 contacts in CW/SSB modes. A one-man expedition followed before the year was out. Bowing to pressures, the Wireless Planning and Coordination Wing of the Ministry of Communications (India's FCC) extended the deadline to March 31, 1984, paving the way for one more team to raise the tally by a further 5000 contacts.

The dollars and IRCs have begun rolling in, and each team has begun responding to the QSLs that are flooding in. When the gold rush is over, it will be time for the expeditioners to reckon how worthwhile the trek to the west was!

IRAQ

Herbert Perkins WA2JRV
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Rochester NY 14617

During my last trip to Baghdad, I was privileged to be a guest at YI1BGD (Scientific Center, Box 5864, Baghdad) and to take photographs. I have fortunately been able to visit the station several times and I want others to understand some of the problems faced by the club in Baghdad.

To guarantee a QSL card, you must send three IRCs *dated after 1 July 1981*. The date is very important because ones issued prior to 1 July 1981 are not valid in Iraq. A self-addressed envelope and of course your card should also be sent.

The letter to YI1BGD should be addressed to the operator *but should not have a callsign* in the address. Do not send any money; it will not get to the club.

The club promises that any QSL cards received will be acknowledged, but everyone needs to understand that over 500 cards a month are received, of which 50% have IRCs and a return envelope, 20% have only IRCs, and 30% have no IRCs and no envelope. The club presently has over 2000 IRCs that are not valid in Iraq and cannot be used to defray the cost of QSLing.

The club is supported entirely by the 6 operators, and just the cost of postage for a one-year period is staggering. As a last resort, the club will send QSLs to the respective bureaus in each country, but this process can sometimes take up to 12 months to complete.

You might also be interested to know where all the club equipment comes from. The Drake C line was donated by JY1, His Majesty King Hussein of the Hashemite Kingdom of Jordan. The Atlas 210 was donated by the Radio Amateur Society of Yugoslavia. The Yaesu FT-101E was donated by JA1BK, the keyer by DL6QW, and the triband antenna and rotator were donated by the Northern California DX Association through OH2BH and the Radio Amateur Society of Finland.

The special call of YI1BIF was used November 3-20 to celebrate the Baghdad International Trade Fair.

JY9IU/HB9AIU and I assisted in setting up the station. Over 2000 contacts were made, and most QSLs should be answered by now.

YI1BGD is usually on the Arabian Knight Net at 0500 GMT two days a week and, if possible, every morning at 0500 to 0700 GMT on the Rare DX Net headed by JY3ZH. If time and operators permit, they are also on from 1500 to 1700 GMT Monday and Wednesday.

ITALY

Giancarlo Martelli I0XXR
Via Bevignani 18
00162 Rome
Italy

THE ITALIAN AFFAIR

I excuse myself with the readers not being able to write from Italy last month due to several reasons, the main of which is the effort spent with discussions and actions with other fellows directed to defend our rights and to restore our privileges at the same level as the other European countries.

I have already explained what happened here in Italy: fines and license suspensions for amateurs who were found outside the borders of an ancient and outdated law and regulation. So much has happened during the last two months on this matter, and the situation, although improved, is still fluid. I will not now tell the story, which seems to be still susceptible to further development.

Nevertheless, the most important thing

Continued on page 102

Majied at the club station.

From the left: Walter Hediger, Herb Perkins, and Saad (operator at YI1BGD) repairing a dead L4B power supply.

Walter and Saad locating the problem—bad diodes.

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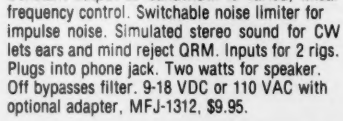

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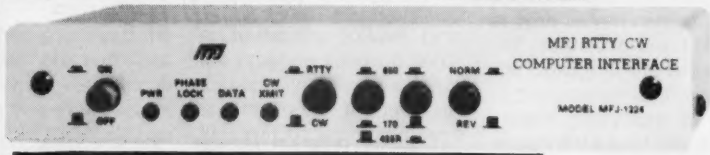

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Copy any shift (170,425,850 Hz and all other shifts) and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII).

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Sharp 8 pole 170 Hz shift/CW active filter gives good copy under crowded, fading and weak signal conditions. Automatic noise limiter suppress static crashes for better copy.

Normal/Reverse switch eliminates retuning. +250 VDC loop output drives RTTY machine. Speaker jack.

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Metal cabinet. Brushed alum. front. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

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Random VIC

Code-loving Commodore addicts asked for this. Ye shall receive.

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For those of you who don't know who or what the VIC-20 is, it is the low-cost micro from Commodore, the makers of the Pet microcomputer. The VIC-20 is built around the 6502 chip and comes from the factory with 5K of memory, of which 3583 bytes are RAM. The VIC-20 can be expanded to 32K by the addition of memory expanders. The memory-expander cartridges can be plugged into the back of the VIC through the expansion port. They come in 3K, 8K, and 16K sizes and can be used alone or all together with a mother board to give you a total of 32K.

The VIC also has interface cartridges which can be plugged into the back of the user port. The VIC will interface through an RS-232 cartridge, an IEEE-488 cartridge, or through a phone modem. I have used the VIC phone modem to plug into one of the many computer services and it works very well. The phone modem comes with the necessary software to turn the VIC into a terminal. As of yet, I have not used the VIC for RTTY or ASCII over the ham bands.

Data or program storage can be saved on the VIC floppy disk or the VIC cassette drive. Also available for the VIC-20 is the VIC printer. It can be used to list programs, or the contents of the screen can be sent to the printer.

The VIC comes with all the necessary cord and filters so that the home TV can be used for the video display, or a color monitor can be used with no external interfacing. The screen size is 22 columns by 22 rows which sometimes can be an inconvenience. The Commodore people say there is a cartridge, the

Program listing.

```
1 PRINT"■■■■■■■CODE PRACTICE PROGRAM"
2 PRINT"■■■"SPC(9)"BY":PRINTSPC(4)"■■EUGENE MORGAN":PRINT"■■■■ (C) COPYRIGHT 198
2"
3 FORT=1TO2000:NEXT
4 POKE36878,15:GOTO19:REM TURN ON SOUND
5 POKEA,B:FORT=1TOZ%:NEXT:POKEA,0:FORT=1TOT%:NEXT:RETURN:REM DAH
6 POKEA,B:FORT=1TOT%:NEXT:POKEA,0:FORT=1TOT%:NEXT:RETURN:REM DIT
7 FORT=1TOS%:NEXT:RETURN
19 PRINT"■  ■TO STOP PROGRAM HIT■        ■ANY KEY■":PRINT"■(BE SURE TO TURN UP
  SOUND)"
20 PRINT"■■■■WHAT SPEED?":PRINT"5...WPM":PRINT"10..WPM":PRINT"15..WPM":PRINT"20.
.WPM"
21 PRINT"25..WPM":PRINT"30..WPM":PRINT"35..WPM"
22 A=36875:B=240:REM PITCH OF TONE
25 INPUTW%:REM SPEED
26 IFW%=5THENT%=180:GOTO40
27 IFW%=10THENT%=90:GOTO40
28 IFW%=15THENT%=68:GOTO40
29 IFW%=20THENT%=45:GOTO40
30 IFW%=25THENT%=40:GOTO40
31 IFW%=30THENT%=34:GOTO40
32 IFW%=35THENT%=28:GOTO40
40 Z%=T%*3:S%=T%:PRINT"■■"SPC(5)W%" WPM.■"
49 V%=0:N%=1
50 FORT=1TOT%:NEXT
51 GOSUB850
60 IFA$="A"THENGOSUB6:GOSUB5:GOTO150
61 IFA$="B"THENGOSUB5:GOSUB6:GOSUB6:GOSUB6:GOTO150
62 IFA$="C"THENGOSUB5:GOSUB6:GOSUB5:GOSUB6:GOTO150
63 IFA$="D"THENGOSUB5:GOSUB6:GOSUB6:GOTO150
64 IFA$="E"THENGOSUB6:GOTO150
65 IFA$="F"THENGOSUB6:GOSUB6:GOSUB5:GOSUB6:GOTO150
66 IFA$="G"THENGOSUB5:GOSUB5:GOSUB6:GOTO150
67 IFA$="H"THENGOSUB6:GOSUB6:GOSUB6:GOSUB6:GOTO150
68 IFA$="I"THENGOSUB6:GOSUB6:GOTO150
69 IFA$="J"THENGOSUB6:GOSUB5:GOSUB5:GOSUB5:GOTO150
70 IFA$="K"THENGOSUB5:GOSUB6:GOSUB5:GOTO150
71 IFA$="L"THENGOSUB6:GOSUB5:GOSUB6:GOSUB6:GOTO150
72 IFA$="M"THENGOSUB5:GOSUB5:GOTO150
73 IFA$="N"THENGOSUB5:GOSUB6:GOTO150
74 IFA$="O"THENGOSUB5:GOSUB5:GOSUB5:GOTO150
75 IFA$="P"THENGOSUB6:GOSUB5:GOSUB5:GOSUB6:GOTO150
76 IFA$="Q"THENGOSUB5:GOSUB5:GOSUB6:GOSUB5:GOTO150
77 IFA$="R"THENGOSUB6:GOSUB5:GOSUB6:GOTO150
```

Victerm-40, that gives the VIC a 40 by 22 screen. As of this writing, I have not used it.

The VIC-20 can be programmed in Basic or machine language. It is very easy to mix Basic and machine language together in a program by the use of a simple command, SYS.

The Program

I chose Basic for the random code-practice program because it would be easy to adapt to other computers and also because speed of execution was not an important factor. No memory expansion is needed to run this program. If you are using expansion cartridges, they should be switched off or removed. This program takes only 2227 bytes.

The code-practice program sends a random code at whatever speed you select. You will be prompted for a sending speed from 5 wpm to 35 wpm in steps of 5. The code sound is made at the same time as the letter is printed on the screen. Printing the symbol at the same time as it is sounded can be very helpful when trying to associate the symbol with the sound.

If you prefer, you can blank out the screen so that you cannot see the symbols being printed until you stop the program. The method for doing this is as follows.

First, when you reach the part of the program that asks you for a speed, type in your selection—but before you press RETURN, change the cursor to white. This is done by pressing the CTRL key and 2 key together. This will make the cursor disappear. Now all symbols will be printed the same color as the screen. In order to see what has been printed on the screen, you must stop the program by pressing any key; then hit the RUN STOP key. Then POKE 36879,8 and the screen will turn back and you will see what has been printed.

To rerun the program, press the RUN STOP key and the RESTORE key together. This will change the screen back to white and go back to the first of the program.

The way the program is set to run is as follows. First, the program gives my information. By pressing any key you move into the program. You will be prompted for a speed. A menu will be printed on the screen for your selection. Enter your choice and press RETURN. The screen will clear and you will hear a code and the symbols will appear on the screen in groups of five. Be sure to turn the volume on.

When you have copied enough, just press any key. The code will stop and you will be asked if you would like to select a new speed. If you do, then just press any key. The screen will clear and you will again be given a selection from 5 wpm to 35 wpm.

The first part of the program, lines 1–3, deals with my information. Line 4 sets the volume on the VIC; 15 is as high as you can go. Lines 5–7 are the Gosubs. I placed the Gosubs at the beginning of the program as a memory-crunch procedure to conserve memory. It would have taken more memory and more typing time if I had used three-digit numbers.

Line 19 is an instruction prompt for halting the program. Lines 20 and 21 print the speed menu. Line 25 asks for your choice. Line 22 sets the pitch of the sounds. You can change the pitch of the Dah and Dit by POKEing 36875 to any value from 128 to 255.

Lines 26 through 32 set the length of T%. T% is used to set the lengths of the Dit, Dah, and the spaces. You can change the speeds by changing the value of T%. Line 40 sets the length of the Dah and Z%. Z% is three times longer than T%. This will make the Dahs three times longer than the Dits. Line 40 also sets the value of S% which is the length of the space between words. S% is four times longer than T%.

Line 50 is the space between each symbol. Lines 60 through 109 are the symbols with the Gosubs to get each Dah and Dit. Line 100 is the blank space between the groups. Line 150 tells the VIC to go back and count to T% and delay between symbols. Line 850 looks to see if

```
78 IFA$="S"THENGOSUB6:GOSUB6:GOSUB6:GOTO150
79 IFA$="T"THENGOSUB5:GOTO150
80 IFA$="U"THENGOSUB6:GOSUB6:GOSUB5:GOTO150
81 IFA$="V"THENGOSUB6:GOSUB6:GOSUB6:GOSUB5:GOTO150
82 IFA$="W"THENGOSUB6:GOSUB5:GOSUB5:GOTO150
83 IFA$="X"THENGOSUB5:GOSUB6:GOSUB6:GOSUB5:GOTO150
84 IFA$="Y"THENGOSUB5:GOSUB6:GOSUB5:GOSUB5:GOTO150
85 IFA$="Z"THENGOSUB5:GOSUB5:GOSUB6:GOSUB6:GOTO150
86 IFA$="1"THENGOSUB6:GOSUB5:GOSUB5:GOSUB5:GOSUB5:GOSUB5:GOTO150
87 IFA$="2"THENGOSUB6:GOSUB6:GOSUB5:GOSUB5:GOSUB5:GOTO150
88 IFA$="3"THENGOSUB6:GOSUB6:GOSUB6:GOSUB5:GOSUB5:GOTO150
89 IFA$="4"THENGOSUB6:GOSUB6:GOSUB6:GOSUB6:GOSUB5:GOTO150
90 IFA$="5"THENGOSUB6:GOSUB6:GOSUB6:GOSUB6:GOSUB6:GOTO150
91 IFA$="6"THENGOSUB5:GOSUB6:GOSUB6:GOSUB6:GOSUB6:GOTO150
92 IFA$="7"THENGOSUB5:GOSUB5:GOSUB6:GOSUB6:GOSUB6:GOTO150
93 IFA$="8"THENGOSUB5:GOSUB5:GOSUB5:GOSUB6:GOSUB6:GOTO150
94 IFA$="9"THENGOSUB5:GOSUB5:GOSUB5:GOSUB5:GOSUB6:GOTO150
95 IFA$="0"THENGOSUB5:GOSUB5:GOSUB5:GOSUB5:GOSUB5:GOTO150
100 IFA$=CHR$(32)THENFORT=1TOS%:NEXT:GOTO150
101 IFA$=","THENGOSUB6:GOSUB5:GOSUB6:GOSUB5:GOSUB6:GOSUB5:GOTO150
102 IFA$="."THENGOSUB5:GOSUB5:GOSUB6:GOSUB6:GOSUB5:GOSUB5:GOTO150
103 IFA$="?"THENGOSUB6:GOSUB6:GOSUB5:GOSUB5:GOSUB6:GOSUB6:GOTO150
106 IFA$=":"THENGOSUB5:GOSUB5:GOSUB5:GOSUB6:GOSUB6:GOSUB6:GOTO150
107 IFA$=";"THENGOSUB5:GOSUB6:GOSUB5:GOSUB6:GOSUB5:GOSUB6:GOTO150
108 IFA$="/"THENGOSUB5:GOSUB6:GOSUB6:GOSUB5:GOSUB6:GOTO150
109 IFA$="-"THENGOSUB5:GOSUB6:GOSUB6:GOSUB6:GOSUB6:GOSUB5:GOTO150
150 GOTO50
850 GETL$:IFL$=""THEN900
855 IFL$>"0"THEN1200
900 X=INT(RND(1)*90)+1
901 IFX<44THEN900
902 IFX=60THEN900
903 IFX=61THEN900
904 IFX=62THEN900
905 IFX=64THEN900
907 V%=V%+1:N%=N%+1
908 IFV%=6THENX=32:V%=0
909 IFN%=300THEN1300
950 A$=CHR$(X):PRINTA$;:RETURN
1200 PRINT" ■STOP■":PRINT"■TO SELECT A NEW SPEED":PRINT"■HIT ANY KEY.■"
1205 GETJ$:IFJ$=""THEN1205
1210 GOTO19
1300 PRINT"■■"SPC(16)"** STOP **":PRINT"   PRESS ANY KEY TO"SPC(9)"CONTINUE.■"
1305 GETE$:IFE$=""THEN1305
1310 GOTO40

READY.
```

a key has been pressed. If one hasn't been pressed, then the program goes to line 900, at which point a random number between 1 and 90 is generated.

Lines 901 to 905 take care of the numbers that we can't use in our program. Line 907 keeps track of the number of symbols printed since the last space. Line 908 tells the VIC what to do after it has printed five symbols. Line 950 turns our random number into a symbol and then sends the VIC back to line 60 where it will look for the symbol it has just printed. The program will stay in this loop until a key is pressed. If a key is pressed, line 850 will send the VIC to line 1200 where it will stop the code and print an instruction prompt. Line 1205 will wait for you to press a key. If a key is pressed, the VIC will go to line 19. At line 19, the VIC will start the routine to get a new speed.

I have used the random-code program for almost a month now and have improved my speed by ten words a minute. I hope that you will find the practice as helpful as I have. I haven't used this program on any prospective hams yet, but I have made several code tapes from this program and given them to some of my ham friends. So if your friend doesn't have a VIC, he can take advantage of yours.

I have also made other programs for the VIC-20 for use by the amateur-radio operator. The Ham Log is a program that will keep track of your QSOs by call and state or country. Information can be recalled by typing in a call or a state or a country. Any data can be listed for each station you work. Such data could include the operator's name, address, phone, frequency, rig and antenna, or any interesting tidbit you wish. Data can be updated without any hassle.

Antenna Program

Another very useful program is the antenna-design program. All you do is input the type of antenna and its frequency. I have built some of the antennas and found them to work very well. This program could be very useful to the ham who likes to build his own.

Programming Can Be Fun

I have a very good time experimenting with the VIC. Sometimes it can be frustrating when something you thought would work doesn't and nothing you try will work. You have to scrap the idea and try the same thing from another angle. Then when it does work, it can be very satisfying.

The VIC is, at last, a computer that most people can afford (under $300) and it can get you started in the world of computers. At first, the programs can look very strange with all the Gosubs and Gotos, the POKEs and PEEKs, and all of the other computer jargon. But it will surprise you how fast you can pick it up, and you will be writing your own programs in no time at all.

If you are a ham who just doesn't think that you could use a computer, then I am here to tell you that there are many uses for one in the ham shack even if you never use it on the air. I am sure that after you get the hang of programming—and you don't need to be an expert—you will find many other uses for it around the house. One word of caution: it can be addicting!

If you have any questions or some problems with the random code-practice program, please let me know. ■

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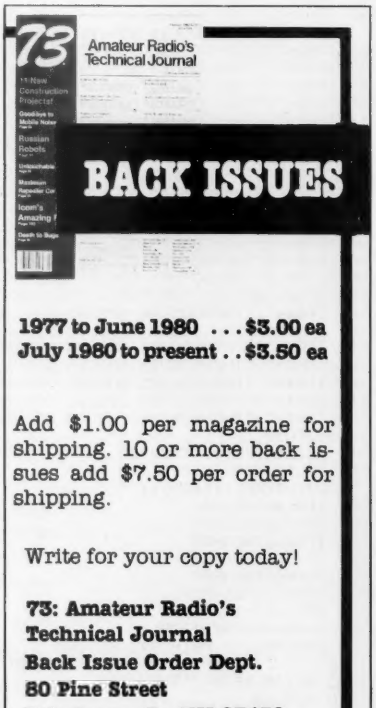
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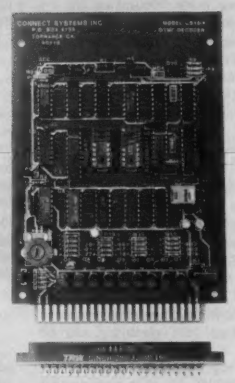

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MAPLE RIDGE BC CAN
JUN 30–JUL 1

The Maple Ridge ARC will host Hamfest '84 on June 30–July 1, 1984, at the Maple Ridge Fairgrounds, 30 miles east of Vancouver. The registration fee is $5.00 for hams and $2.00 for non-hams over 12 years old. Features will include a swap and shop, commercial displays, bunny hunts, and ladies' and children's programs. Food and camper space with electricity will be available. Talk-in on 146.20/.80 and 146.34/.94. For more information or preregistration (20% off gate fee), contact Maple Ridge ARC, Box 292, Maple Ridge BC V2X 7G2.

OVERLAND PARK KS
JUL 4–7

The Mobile Amateur Radio Awards Club, Inc., will hold their annual convention from Wednesday to Saturday, July 4–7, 1984, at the Holiday Inn in Overland Park KS. There will be a picnic for early arrivals on Wednesday evening, and on Thursday there will be area tours and a dinner theater. On Friday there will be antenna and computer forums, and on Saturday morning the annual business meeting will be held. The hospitality suite will be open during the entire convention. For more information, send an SASE to R. L. Dyson KØAYO, R1, Box 230 M, De Soto KS 66018.

MAHOPAC NY
JUL 7

The Putnam Emergency Amateur Repeater League (PEARL) will hold its 3rd annual hamfest on Saturday, July 7, 1984, from 9:00 am to 4:00 pm, at St. John's School Monsignor O'Brien Boulevard, Mahopac NY. General admission is $1.00, indoor tables are $5.00 each, and outdoor tailgating is $4.00. Talk-in on 144.535/145.135 and 146.52. For advance registration and more information, contact Frank Konecnik WB2PTP, RD1, 244 C, Carmel NY 10512.

FARIBAULT MN
JUL 7

The Faribault Amateur Radio Club will hold its 3rd annual swapfest on Saturday, July 7, 1984, from 9:00 am to 3:00 pm, at Rice County Fairgrounds, Faribault MN. Tables are available only by reservation before July 1st. Talk-in on 146.19/.79. For more information, contact Mike Ferguson NØDGG at (507)-744-5145 after 5:00 pm.

OAK CREEK WI
JUL 7

The South Milwaukee Amateur Radio Club will hold its annual swapfest on Saturday, July 7, 1984, from 7:00 am to approximately 5:00 pm, at the American Legion Post #434, 9327 South Shepard Avenue, Oak Creek WI 53154. Admission is $3.00 per person and includes a "Happy Hour" with free beverages. Parking, a picnic area, hot and cold sandwiches, and liquid refreshments will be available. There will be free overnight camping. Talk-in on 146.94 MHz FM. For more details, including a local map, write South Milwaukee Amateur Radio Club, PO Box 102, South Milwaukee WI 53172.

INDIANAPOLIS IN
JUL 7–8

The State ARRL Convention and the Indianapolis Hamfest will be held on Saturday and Sunday, July 7–8, 1984, at the Marion County Fairgrounds at the southeastern intersection of I-74 and I-465. Gate tickets are $4.00 and entitle you to free parking and all activities. Flea-market and commercial vendors may set up at 8:00 am on Saturday, July 7th. Security will be provided Saturday night and Sunday, and free camper facilities and hookups will be available on the grounds. The commercial building will be open to the public at 8:00 am on Sunday, July 8th. There will be technical forums all day Sunday, and professional food service will be provided. For further information, contact Indianapolis Hamfest, Box 11086, Indianapolis IN 46201.

ALEXANDER NY
JUL 8

The Genesee Radio Amateurs, Inc., will hold the Batavia Hamfest on Sunday, July 8, 1984, from 7:00 am to 5:00 pm, at the Alexander Firemen's Grounds, Rte. 98, Alexander NY. Admission is $3.00 in advance before June 22, 1984, and $4.00 at the door. The commercial exhibit area will open at 9:00 am and there will be hot-air-balloon rides. Activities will include breakfast at 6:00 am, a CW contest, OM and YL programs, a .52 check-in contest, a flea market, a chicken barbecue, and free camping (electricity is $2.00). Talk-in on 6.52 and 4.71/5.31 (W2RCX). For further information, contact GRAM, PO Box 572, Batavia NY 14020.

BOWLING GREEN OH
JUL 8

The 20th annual Wood County Ham-A-Rama will be held on Sunday, July 8, 1984, beginning at 8:00 am, at the Wood County Fairgrounds, Bowling Green OH. Admission and parking are free. Trunk sales and food will be available. Advance table rentals are $5.00 and are for dealers only. Saturday will be available for setups until 8:00 pm. Talk-in on .52. For more information or dealer rentals, send an SASE to Wood County ARC, c/o Craig Henderson, Box 366, Luckey OH 43443.

SHEBOYGAN WI
JUL 14

The fifth annual Sheboygan County Amateur Radio Club Lakeshore Swapfest and Brat Fry will be held on July 14, 1984, from 10:00 am to 4:00 pm, at the Wilson Town Hall, south of Sheboygan WI. Tables are free and camping is available at Terry Andre State Park. For a flyer and other information, write Julian E. Jetzer KR9S, 6400 Hawthorn Road, Sheboygan WI 53081, or phone (414)-457-3366 after 5:00 pm CDT.

MILTON ONT CAN
JUL 14

The Burlington Amateur Radio Club will host the tenth annual Ontario Hamfest on July 14, 1984, from 7:00 am to 4:00 pm, at the fairgrounds in Milton ONT. Tickets are $2.50 in advance and $4.00 at the gate. Weekend camping, free parking, and free flea-market tables will be available. Features will include indoor commercial displays as well as the traditional events. Talk-in on .21/.81 (club repeater). For more details, contact BARC, PO Box 836, Burlington ONT L7R 3Y7, Canada.

EAU CLAIRE WI
JUL 14

The Eau Claire Amateur Radio Club will hold its annual hamfest on Saturday, July 14, 1984, from 8:00 am to 4:00 pm, at the 4-H buildings in Eau Claire WI. Tickets are $2.00 in advance and $3.00 at the door; tables and coffee are free. Talk-in on .31/.91 and .52 simplex. For more information and tickets, send an SASE to Gene Lieberg KA9DWH, 2840 Saturn Avenue, Eau Claire WI 54703.

AUGUSTA NJ
JUL 14

The Sussex County ARC will sponsor SCARC '84 on Saturday, July 14, 1984, beginning at 8:00 am, at the Sussex County Fairgrounds, Plains Road, off Rte. 206, Augusta NJ. Admission is $2.00. Indoor tables are $5.00 in advance and $6.00 at the door; tailgate space is $4.00 in advance and $5.00 at the gate. There will be food and refreshments and plenty of free parking. Talk-in on .90/.30 and .52 simplex. For further information, write Donald R. Stickle K2OX, Weldon Road, RD #4, Lake Hopatcong NJ 07849, or phone (201)-663-0677.

POUGHKEEPSIE NY
JUL 14

The ARRL Mt. Beacon Hamfest will be held on Saturday, July 14, 1984 from 8:00 am to 3:00 pm, at the Arlington Senior High School, Poughkeepsie/Lagrange, Dutchess County NY. Admission is $2.00 (XYL and your children will be admitted free), tailgating is $3.00 (includes one free admission), and a table space is $4.00 (includes one free table and admission). Hot food, beverages, and free parking will be available. There will be an auction beginning at 2:00 pm. Talk-in on 146.37/.97 and 146.52. For more information, contact Art Holmes WA2TIF, 2 Straub Drive, Pleasant Valley NY 12569, (914)-635-2614, or Walt Sutkowski K2DPL, 61 Robin Road, Poughkeepsie NY 12601, (914)-462-5133.

MANCHESTER NH
JUL 14

The New Hampshire FM Association will sponsor an amateur-radio/electronics flea market on Saturday, July 14, 1984, beginning at 9:00 am, at the Manchester Municipal Airport. The rain date will be July 15, 1984. General admission is $1.00 per person and sellers' admission is $5.00 (bring your own table or tailgate). Commercial displays are welcome. Refreshments will be available. Talk-in on 146.52 FM. For further information, contact Dick DesRosiers W1KGZ at (603)-668-8880 and for pre-registration or more information, write Doug Aiken K1WPM, 30 Meadowglen Drive, Manchester NH 03103, or phone (603)-622-0831.

CHARLESTON SC
JUL 14–15

The Charleston Amateur Radio Society will hold its annual hamfest on July 14–15, 1984, at the Omar Shrine Temple. Talk-in on 146.19/.79. For further information, write Hamfest Committee, PO Box 70341, Charleston Heights SC 29405.

BOISSEVAIN MAN CAN
JUL 14–15

The 21st annual International Hamfest will be held on July 14–15, 1984, at the International Peace Garden between Dunseith ND and Boissevain MAN. Activities

HAM HELP

I need a schematic and manual for my Tempo FMH-2, two-meter HT. I also need a good (unbroken) battery tray for same. Please advise of your costs when replying. Thank you.

Randy W. White KB4ALH
506 Robinhood Drive
Seneca SC 29678

Twenty years ago, I read an article on how to convert a TV to an oscilloscope. I have three old B&W TVs which I'd like to convert to some type of test equipment, but I don't know how. Can anybody help?

Guy Milne W2BPN
32 Stag Trail
Fairfield NJ 07006

I am in desperate need of a 5BP4, 5BP1, or equivalent CRT for my Eico model 425 oscilloscope. Any information on where I can find or purchase one would be greatly appreciated.

Ira Linderman
PO Box 229
Commack NY 11725

I need copies of several pages from the manual for the AN/USM 281A oscilloscope (military version of the Hewlett-Packard HP180). I also need some pages from the service manual for the Motorola Mocom 10.

John Tobin KF4WG
6726 Cocos Drive
Orlando FL 32807

I need a schematic or service manual for the Com-Data model 301F2 modem and the Com-Data model 201F4-13 modem. I am also trying to find a current address for Jim Labo KØOST/ex-WB8IDD.

John Hackman WB4VVA
5290 East Valley Road
Mount Pleasant MI 48858

I am looking for the service manual for the NCX-3, or schematics for the power supply for the NCX-3 (by National).

Dennis Bosley WA1URS
186 Hickam Drive
Loring AFB ME 04751
(207)-328-4432

Anyone interested in the Chaverim, an organization formed to promote a closer relationship among Jewish radio amateurs and their friends, please contact me.

Claire Kuperman KA3DNJ
1934 Devereaux Avenue
Philadelphia PA 19149

will include transmitter hunts, mobile judging, and a CW contest. Excellent camping facilities will be available. For more information, contact William W. Bosch WD0EMY or Stanley E. Kittelson WD0DAJ, Box H, Dickinson ND 58601.

LOUISVILLE OH
JUL 15

The Tusco Amateur Radio Club (W8ZX) and the Canton Amateur Radio Club (W8AL) will present the 10th annual Hall of Fame Hamfest on Sunday, July 15, 1984, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Admission is $2.50 in advance and $3.00 at the gate. Tables are for rent on a reserved basis. Talk-in on 146.52/.52 and 147.71/.12. For reservations or more information, write Butch Lebold WA8SHP, 10877 Hazelview Avenue, Alliance OH 44601, or phone (216)-821-8794.

WASHINGTON MO
JUL 15

The 22nd annual Zero-Beaters ARC Hamfest will be held on July 15, 1984, from 9:00 am to 3:00 pm, at the Washington MO Fairgrounds. There is no admission charge. Advance reservations for flea-market spaces under the pavilion are limited and advance reservations are advised. There will be a candy scramble, a gigantic traders' row, sandwiches, dinners, and other refreshments. Talk-in on 147.24/.84 and 146.52. For further information, write Zero-Beaters ARC, Box 24, Dutzow MO 63342.

EDGEWATER PARK NJ
JUL 15

The West Jersey Radio Amateurs will hold their 6th annual hamfest on Sunday, July 15, 1984, from 9:00 am to 3:00 pm, rain or shine, at the Super 130 Drive-In Theatre, Route 130, Edgewater Park NJ (2 miles south of Burlington, 8 miles north of Palmyra). Registration is $3.00 (sellers must bring their own tables). Setup for vendors only is at 7:00 am. Talk-in on 147.75/.15, 144.87/.47, and 146.52. For more information or advance tickets, send an SASE to Mary Lou Shontz N2CLX, 107 Spruce Lane, Route 16, Mount Holly NJ 08060, or phone (609)-267-3063.

LAPORTE IN
JUL 15

The combined LaPorte-Michigan City Amateur Radio Clubs will sponsor their Summer Hamfest on Sunday, July 15, 1984, from 8:00 am to 2:00 pm, at the LaPorte County Fairgrounds, State Road 2, west of LaPorte IN. The donation is $3.00 at the gate. Good food, cold drinks, and paved outdoor parking will be available. For reservations for indoor tables (40¢/foot), write PO Box 30, LaPorte IN 46350.

KUOPIO, FINLAND
JUL 19-22

The Amateur Radio Club of Kuopio will hold the annual hamfest of the Finnish Amateur Radio League (SRAL) on July 19-22, 1984, in Rauhalahti. Activities will include SRAL forums, technical and DX talks, indoor and outdoor programs, and special events for ladies and children. For further information, contact Joxa Hartikainen OH7OO, Kauppakatu 45, SF 70100 Kuopio, Finland.

GLACIER PARK MT
JUL 20-22

The Great Falls Area ARC will present the 50th annual Glacier-Waterton International Hamfest on July 20-22, 1984, at Three Forks Campground on the southern edge of Glacier National Park. Pre-registration is $8.50 and includes Saturday-night dinner (bring own meat and utensils) and Sunday-morning breakfast. Talk-in on .52 and .34/.94. For more information, send an SASE to Shirley Smith KC7OA, 1822 14th Avenue South, Great Falls MT 59405.

TORONTO ONT CAN
JUL 20-22

The Ontario DX Association will sponsor the ANARC 1984 Convention on July 20-22, 1984, at the Ramada Renaissance Hotel in Toronto. Registration is $20.00 per person. Activities will include seminars on radio listening, displays from manufacturers of hobby equipment, forums with broadcasters from around the world, and a Saturday-evening banquet. The banquet fee is $25.00 per person. For registration information and a schedule of activities, send a self-addressed envelope and a first-class stamp (do not affix the stamp to the envelope) to ANARCON '84, PO Box 232, Station Z, Toronto, Ontario, Canada M5N 2Z4.

WELLINGTON OH
JUL 21

The Northern Ohio Amateur Radio Society will hold its 7th annual ARRL-approved NOARFEST on July 21, 1984, from 8:00 am to 4:00 pm, at the Lorain County Fairgrounds, Wellington OH. Donations are $3.00 in advance and $3.50 at the gate. Children under 12 will be admitted free. There will be a huge blacktopped flea-market area and parking is $1.00 per car space. Flea-market setup is from 6:00 am to 8:00 am. Indoor exhibit spaces with an 8-foot table are $8.00 each. Send check for advance registration to John Paul Jones WA8CAE, 4612 Timberview Drive, Lorain OH 44052, or phone (216)-282-4256. Campers may park overnight Friday at no charge but no hookups will be available. Talk-in on 144.55/145.15 and 146.52. For admission tickets, write NOARFEST, PO Box 354, Lorain OH 44052.

PETOSKEY MI
JUL 21

The Straits Area ARC will hold its annual swap shop and computer demonstration on July 21, 1984, from 9:00 am to 2:00 pm, in the 4-H Building at the Emmet County Fairgrounds. Admission is $2.50 and tables are $3.00 each; setups are at 8:00 am. RV camping will be available nearby. Talk-in on 146.67 and .52. For more details, write Irene Stein KA8NKS, 4487 Robinson Road, Pellston MI 49769, or phone (616)-539-8986.

CROSSVILLE TN
JUL 21-22

The Cookeville Repeater Association and the Plateau ARC will hold the annual Crossville Hamfest on July 21-22, 1984, at the Cumberland County Community Complex, Highway 70N, Crossville TN. Talk-in on 147.69/.09 and 147.93/.33. For further information, contact PARC, PO Box 2621, Crossville TN 38555.

PALMYRA IL
JUL 21-22

The Quad-Co. Amateur Radio Club will sponsor the 27th annual hamfest of the Breakfast Club on July 21-22, 1984, at Terry Park, ¾ of a mile east of Palmyra IL. Camping facilities will be open from Friday afternoon until Monday morning. There will be

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games, contests, golfing, fishing, and gear swapping, and on Saturday night, dancing and movies. Bring your own basket lunch; sandwiches and soft drinks will be available. Talk-in on 3973 kHz from noon Saturday to 11:00 am Sunday. For more information, write Hamfest, c/o Quad-Co. ARC, 602-D East Walnut, Chatham IL 62629.

EUGENE OR
JUL 21-22

The 9th annual Lane County Ham Fair will be held on July 21-22, 1984, at the Oregon National Guard Armory, 2515 Centennial (across from Autzen Stadium), Eugene OR. Doors will open at 8:00 am both days. Registration and swap tables are $5.00 each. Because of limited space, a non-refundable reservation is required for swap tables (maximum: 2). In addition to swap tables, features will include a 2-meter bunny hunt, technical seminars, computer demonstrations, license exams, bingo, a kiddie korner, and women's activities. There will be an all-day snack bar, free parking for RVs (no hookups), and a Saturday pot-luck supper at 6:00 pm. Talk-in on 146.28/.88, 147.86/.26, and on .52/.52. For advance tickets or table reservations, send a check payable to Lane County Ham Fair and an SASE to Tom Temby WB7WPU, Treasurer, 3227 Crocker Road, Eugene OR 97404, or phone (503)-689-1761. Ticket packets may also be picked up at the pre-registration table at the Ham Fair.

OKLAHOMA CITY OK
JUL 21-22

The Central Oklahoma Radio Amateurs will host Ham Holiday and the State ARRL Convention on July 21-22, 1984, at the Lincoln Plaza Inn and Conference Center, 4445 Lincoln Boulevard, Oklahoma City OK 73105. Pre-registration (before July 6th) is $8; at the door, tickets are $10. The Saturday-evening banquet ticket is $14.00 and the Sunday QCWA breakfast is $7.20. Flea-market tables are $5.00 each in advance and, if available, $8.00 each at the door. In addition to these activities, there will be programs, special-interest events, unlimited free parking for cars and self-contained RVs, the flea market on Saturday, and dealer displays on Saturday and Sunday. For reservations, write CORA, PO Box 44091, Oklahoma City OK 73144. For a special hotel rate of $47.00 (plus tax) for a double, call (800)-522-8034 (Oklahoma) or (800)-654-8419 (out of state).

WHEELING WV
JUL 22

The Triple States Radio Amateur Club will hold its 6th annual Wheeling WV Hamfest on Sunday, July 22, 1984, from 9:00 am to 4:00 pm, at Wheeling Park. Admission is $3.00 and children 12 and under will be admitted free. Dealers are welcome and tables are available. There will be a flea market and auctions, all under cover. Refreshments and free parking will be available. Talk-in on 146.31/.91 and 147.75/.15. For a four-page brochure with more information and a map, contact TSRAC, Box 240, RD 1, Adena OH 43901, or phone (614)-546-3930.

BEAVERTON OR
JUL 27-29

The Willamette Valley DX Club will hold the 1984 DX Convention on July 27-29, 1984, at the Greenwood Inn, Beaverton OR. For further information, write Bob Herndon W7XN, 607 Andover Place, Portland OR 97202, or phone (503)-232-2740.

HOUGHTON MI
JUL 28

The Copper Country Radio Amateur Association will host the 1984 Upper Peninsula Hamfest on July 28, 1984, at the Memorial Union Cafeteria on the campus of Michigan Technological University, Houghton MI. For further information, write Howard Junkin N8FHF, Co-Chairman, UP Hamfest, 106 West South Street, Houghton MI 49931, or phone (906)-482-4630.

GLENWOOD SPRINGS CO
JUL 28

The Ski Country ARC will hold its third annual swapfest, in conjunction with the CCARC meeting, on July 28, 1984, from 9:00 am to 3:30 pm, at the CMC building, 1402 Blake, Glenwood Springs CO. Full tables are $5.00 and half tables are $3.00. There will be guest speakers and demonstrations. Talk-in on 146.07/.67. For further information, contact Bob Ludtke K9MWM, 1001 Grand Avenue, Glenwood Springs CO 81601, or phone (303)-945-5966.

ASHEVILLE NC
JUL 28-29

The Western North Carolina Hamfest and Computer Fair will be held on July 28-29, 1984, at the Buncombe County Fireman's Association Training Center in West Buncombe County, near Asheville. There will be large indoor areas with dealers' tables ($5.00 each per day), an outdoor flea market, and spaces for self-contained vehicles (no hookups). For more information or reservations, contact Ed Erwin WW4O, PO Box 835, 120 Clayton Road, Arden NC 28704.

WEST FRIENDSHIP MD
JUL 29

The Baltimore Radio Amateur Television Society (BRATS) will present the BRATS Maryland Hamfest and Computerfest on Sunday July 29, 1984, at the Howard County Fairgrounds, Route 144 at Route 32, adjacent to Interstate 70, West Friendship MD, about 15 miles west of the Baltimore Beltway (695). Table sales are by advance reservation only; indoor tables along the wall with ac are $20.00 each and indoor tables in the center of the floor without ac are $10.00 each. Quantity discounts and booths are available. There will be plenty of outdoor tailgating and RV hookups will be available. Dealer setups begin Saturday at 2:00 pm with overnight security provided. Talk-in on 146.76 (−600), 147.03 (+600), and .52 simplex. For table reservations and more information, write BRATS, PO Box 5915, Baltimore MD 21208, or call Mayer Zimmerman W3GXK at (301)-655-7812.

NASHVILLE TN
JUL 29

The Radio Amateur Transmitting Society will hold the sixth annual Nashville Ham and Computer Fest on Sunday, July 29, 1984, from 8:00 am to 3:30 pm, at the Nashville Municipal Auditorium at the intersection of James Robertson Parkway and Gay Street in downtown Nashville TN. There will be no admission charge and

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tables will be available for $5.00. For further information, send an SASE to Willie Porter KB4BLL, 4907 Idaho Avenue, Nashville TN 37209.

POMONA CA
AUG 4

The Tri-County Amateur Radio Association will hold its annual hamfest on Saturday, August 4, 1984, from 8:00 am to 4:00 pm, at Palomares Park Recreation Hall, 491 E. Arrow Highway (the north side of Arrow Highway at Orange Grove, between Towne and Garey), Pomona CA. Admission is a $1.00 donation. Swap tables (2½' × 8') are a $5.00 donation per table and the hall will open at 7:00 am for setup only. Tables are limited and must be reserved in advance (no personal tables will be allowed inside or outside the hall). Food, drink, and free parking will be available. Features will include awards, programs, and VCR tapes; and examinations will be given, if possible, for Novice, Technician, General, and Advance class licenses. Talk-in on 146.025+. For advance registration, make checks payable to TCARA and send with an SASE to Joe Lyddon WB6UFX, 6879 Sard Street, Alta Loma CA 91701.

TRAIL BC CAN
AUG 4

The Beaver Valley Amateur Radio Club will hold a swapfest on August 4, 1984, beginning at 10:00 am, at the Cominco Arena, Trail BC. Talk-in on 146.84/.24. For further information and reservations for table space, please contact BVARC, c/o 3798 Woodland Drive, Trail BC V1R 2V7.

JACKSONVILLE FL
AUG 4-5

Six amateur radio clubs of the greater Jacksonville area will sponsor the eleventh annual Greater Jacksonville Hamfest on August 4-5, 1984, at the Orange Park Kennel Club, US 17 South near I-295. Registration is $4.00; swap tables are $9.00 for one day or $15.00 for the weekend. (All proceeds go to the promotion of amateur radio.) Saturday hours are 8:00 am to 5:00 pm and Sunday hours are 9:00 am to 3:00 pm. Features will include a large swap-table area, forums and programs, exhibitors, and plenty of free parking. Special discounts and promotions are available to exhibitors contracting for space before July 15th. For registrations, swap tables, special hotel rates, and more information, write Mike Parnin N4EPD, 6716 Diane Road, Jacksonville FL 32211.

ANGOLA IN
AUG 5

The Steuben County Radio Amateurs will present the 26th annual FM Picnic and Hamfest on Sunday, August 5, 1984, at Crooked Lake, Angola IN. Admission is $2.50. Features will include picnic-style BBQ chicken, inside tables for exhibitors and vendors, a large electronics flea market, and overnight camping (fee charged by County Park). Talk-in on 146.52 and 147.81/.21.

AUSTIN TX
AUG 10-12

The Austin Amateur Radio Club and the Austin Repeater Organization will sponsor Austin Summerfest '84 on August 10-12, 1984, at the Austin Marriott Hotel, Interstate 35 at Highway 290. Admission is $5.00 in advance (deadline: July 31st) and $7.00 at the door. Swapfest tables are available on a first-come, first-served basis, but each seller may reserve tables in advance (limit 2) for $1.00 each and claim them by 10:00 am Saturday. Activities will include a 20-kHz 2-meter band-plan forum, a packet-radio discussion and demonstration, a transmitter hunt, and a full schedule of ladies' programs. Admission to the ladies' events is $4.00. Talk-in on 146.34/.94. For more information, write Austin Summerfest '84, PO Box 13473, Austin TX 78711.

TACOMA WA
AUG 11-12

The Radio Club of Tacoma (W7DK) will present Hamfair 1984 on August 11-12, 1984, at Olsen Auditorium on the campus of Pacific Lutheran University. Registration is $5.00 and trailer and dormitory space will be available on campus at reasonable rates. Advance registration is available for the Saturday-night banquet, commercial space, and flea-market tables. Talk-in on 147.88/.28 (W7DK). For additional information and advance registration, please contact Grace Teitzel AD7S, 701 South 120th, Tacoma WA 98444.

CHARLOTTE VT
AUG 11-12

The annual BARC International Hamfest will be held on Saturday and Sunday, August 11-12, 1984, at the Old Lantern Campgrounds, Charlotte VT. Tickets are $4.00 for both days and heterodynes under 12 will be admitted free. Flea-market space is $2.00 and indoor space is $5.00. Overnight camping will be available and features will include the Can-Am tug-of-war. Talk-in on .34/.94, .01/.61, and .52 simplex. For additional information, contact Roger Farley WA1OZE, President, Burlington ARC, PO Box 312, Burlington VT 05402.

CANYON TX
AUG 11-12

The Panhandle Amateur Radio Club, Inc., will hold its annual hamfest on Saturday and Sunday, August 11-12, 1984, in the Student Activities Center, West Texas State University, Canyon TX. Doors will open at 8:00 am each day with plenty of free tables and space for all. Registration per person is $5.00 in advance and $6.00 at the door. Features will include a swapfest, commercial distributors, meetings, and a ladies program. Talk-in on 146.94 and 3.933 MHz. For more information on pre-registration, motels, and RV camps, contact the PARC, PO Box 10221, Amarillo TX 79116, or Jim Ogle WB5UDX at (806)-359-1002.

WARRINGTON PA
AUG 12

The Mid-Atlantic Amateur Radio Club will hold its annual hamfest on Sunday, August 12, 1984, from 9:00 am to 4:00 pm, rain or shine, at the Bucks County Drive-In, Route 611, Warrington PA (5 miles north of the Willow Grove exit of the Pennsylvania Turnpike). Admission is $3.00 with $2.00 additional for each tailgate space (bring your own table). Ample parking and refreshments will be available. Talk-in on 147.66/.06 (WB3JOE/R) or 146.52. For further information, write MARC, PO Box 352, Villanova PA 19085, or call Bob Josuweit WA3PZO at (215)-449-9727.

WILLOW SPRINGS IL
AUG 12

The 50th annual Hamfesters' Hamfest will be held on Sunday, August 12, 1984, at Santa Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of Chicago). Tickets are $3.00 in advance and $4.00 at the gate. There will be an exhibitor's pavilion and the famous swappers' row. Talk-in on 146.52. For advance tickets, send a check or money order to Hamfesters, PO Box 42792, Chicago IL 60642.

GEORGETOWN KY
AUG 12

The Bluegrass Amateur Radio Society will sponsor the Central Kentucky ARRL Hamfest on Sunday, August 12, 1984, from 8:00 am to 5:00 pm, at Scott County High School, Lonlick Road and US Route 25, Georgetown KY (off I-75/64). Tickets are $3.50 in advance and $4.00 at the gate. There is no charge for outside flea-market space. Features will include technical forums, awards, and exhibits in a/c facilities. For more information or tickets, write Edward B. Bono WA4ONE, PO Box 4411, Lexington KY 40504.

HAVRE MT
AUG 17-19

The Northcentral Montana Hamfest will be held on August 17-19, 1984, in Beaver Creek Park at Marden's Campground, 28 miles south of Havre MT.

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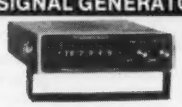

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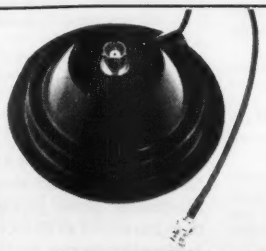

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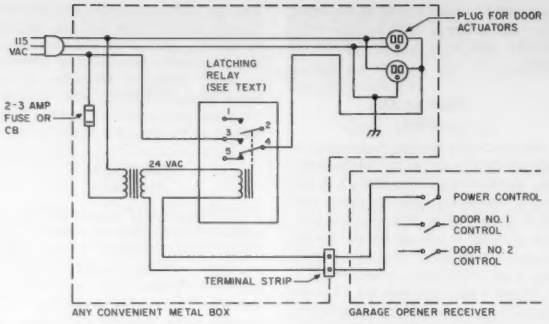
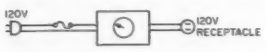
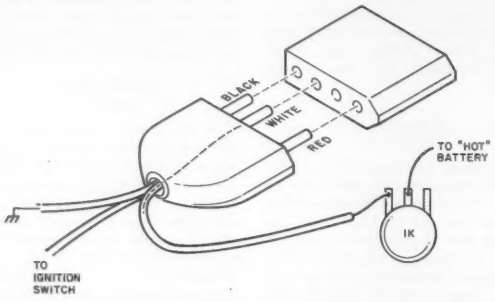


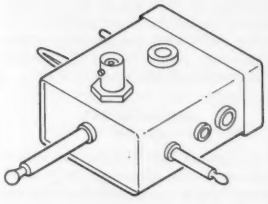
A GARAGE-DOOR OPENER CAN DO MORE: You can make the spare channels on a garage-door opener with the circuit shown here. Anything you want can be turned on or off, as long as it is within the amperage capability of the relay. One part, the latching relay, can be found at Heath (part #273-3). The transformer to operate it is part #273-4.—James Smith K5PTC, Irving TX.



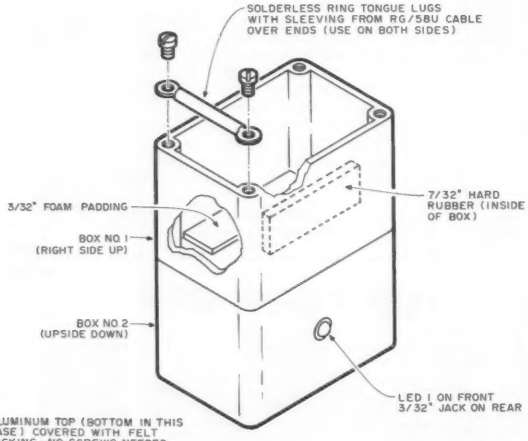
ANOTHER HEAT CONTROL FOR A SOLDERING IRON: This control uses a solid-state dimmer switch. These high-low rotary dimmer switches will control resistance loads of up to 600 Watts. Wire one up with a fuse in a small utility box and you will have an infinite heat control for soldering. Incidentally, if you use a dimmer switch rated at 600 Watts, it can also be used as a speed control for your 3/8-inch electric drill.—E. A. Rowe W7PWQ, Chelan WA.



PERMANENT POWER FOR THE IC-25A/H: Here's a way to keep your memory without having to worry whether you left the radio on. Add a third connection in the power plug as shown. Connect this to a continuous 12-V source through a suitable resistance to drop it to 9 V (I used a 1k trimmer adjusted to 670 Ohms). Connect the normal power lead of the radio to an appropriately-switched 12-V source, and the memory will receive power even when the radio is turned off.—Virginia Smith KA6NVB, San Diego CA.



MULTIPLE PLUG ADAPTER: After years of struggling to find the right adapter for the right piece of gear, I built one that handles many types of connections. I took a small hinged-lid box, like the boxes that small bandages come in, and mounted a phone plug on one end. Then I added a variety of different sockets on the sides of the box. I included BNC and RCA connectors, pin jacks, small sockets, and banana jacks. Now I save a lot of time when servicing and testing.—Wm. Bruce Cameron WA4UZM, Temple Terrace FL.


SOLDERLESS RING TONGUE LUGS WITH SLEEVING FROM RG/58U CABLE OVER ENDS (USE ON BOTH SIDES)
3/32" FOAM PADDING
BOX NO. 1 (RIGHT SIDE UP)
BOX NO. 2 (UPSIDE DOWN)
7/32" HARD RUBBER (INSIDE OF BOX)
LED 1 ON FRONT 3/32" JACK ON REAR
ALUMINUM TOP (BOTTOM IN THIS CASE) COVERED WITH FELT BACKING - NO SCREWS NEEDED

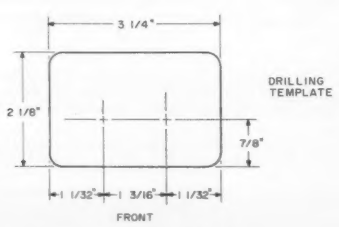


Fig. 1. Mechanical details.

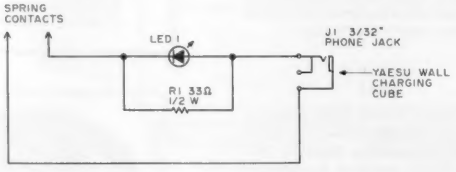


Fig. 2. Charger schematic.

STAND-UP CHARGER FOR YAESU HTs: Inexpensive Radio Shack parts can be used to make a charger for the Yaesu FT-208R transceiver. Small screws (such as 6-32 MS) are threaded through both boxes (RS #270-230) using the drilling dimensions shown in Fig. 1. Matching spring material is threaded onto both screws to make contact with the charging buttons on the bottom of the FT-208R. Experiment to get the best contact, then add rubber padding to the top box to obtain a snug fit. The charging circuit in Fig. 2 will drop the normal charging current about 10 mA, from 45 mA to 35 mA, which will increase the total charging time. J1 is RS #274-292, R1 is RS #271-007, and LED1 is RS #276-069. The LED will glow only when proper contact is made with the bottom contacts of the HT.—David F. Miller K9POX, Niles IL.

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W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 8

have about 500 high schools that have ham clubs today. In Japan, there are over 5,200 high schools with ham clubs. And in Japan, when *they* have a *club*...how many of you have ever seen a copy of the Japanese *CQ ham radio* magazine? Runs six or seven hundred pages a month with about a hundred pages of club activities with pictures of maybe 50 to three or four hundred people in the group all having a whale of a time. *Every month.* It's like Dayton every week.

So I hope to do something about that. What I would like to do eventually is to encourage *every high school* in the United States to have a period of their school—one period during school hours—set aside for a high-tech hobby club, amateur radio, computer, astronomy, whatever.

If you make it after school, you run into two problems which are not surmountable. Number one is busing. Number two is overtime pay for teachers. If it's after school, the unions require that they get overtime and that's not in the school budget.

So let's make the club *during* school hours. And I'll bet you if we do that, that we can get virtually every ham club in the country to volunteer somebody to go in and help those students learn and know more about amateur radio. I *know* that I can get the computer-club people to go in and help with the computer clubs.

The rules and regulations. I don't know how many of you have read 97 recently. Not many, I'll bet. But right there up front, 97.0 gives reasons why amateur radio is a service. One reason is to supply communications in case of an emergency. Another reason is to invent and pioneer new technology. Another reason is international friendship.

I'd like to just speak briefly on that [97]. I don't know how many of you operate 20 meters and have listened to the pile-ups...the list operation on the contests. As far as international friendship is concerned: hardy, har, har, har. [Guffaws.]

Inventing and pioneering new technologies. About 20 years ago, we were pretty good at that. We invented and pioneered single sideband. We invented and pioneered narrowband FM. And, as they say, what have *you* done for us lately? *Not much.*

Unfortunately, most of the pioneering, most of the inventing, is done by youngsters. And we have stopped having youngsters coming into the hobby.

Our country has lost over one *million* engineers and technicians that would have come into the industry by way of amateur-radio-starting. And that's why we are not designing or building very much electronic equipment or that has a lot to do with it.

I hope we can reverse that. Have you seen any military equipment lately? It's all high-speed digital. How many people here are on high-speed digital? Thank you. We have one person here who might be of value to the military. No, forty years ago when we had a war you read about it in the papers; 80 percent of the hams volunteered and went into the military. And we were *of value.*

But we are so hopelessly out of touch with electronic technology today and unfortunately such a high percentage of us are in our 50s, 60s, and 70s, and 80s that we're really not of much value to the country any more as a supply of trained operators. [Grumbling.]

That leaves us with emergency communications. The replies that were sent to the FCC by about a hundred ARRL clubs on the no-code proposal were very clear. And they said in essence (and I would say they said very clearly) that we need Morse code because it's the only means of communication of last resort. When everything else fails, you have Morse code.

I would like to see somebody convert a transistor radio for CW. I would like to see somebody take an HT and dust it off after the atomic attack and try to make it work on Morse code. Because that's what we're going to have, mobile rigs and HTs.

Yes, 30 years ago when you had tube radios, you could wire something up and make a Morse-code transmitter out of it. And we have all those people that used to be able to do that commenting on the no-code license. I look and see what Japan has done with that and the supply of Japanese licensed amateurs increasing from 18,000 to one and a quarter million at the same time that we went from 285,000 to 400,000.

And (unfortunately) they are the best operators in the world. For those who say you must have Morse-code skill in order to be a good operator, I've never seen any correlation.

Now, I don't know if no-code would work in this country or not and would make a difference and would encourage people to get into amateur radio. But I think it's worth a try.

If Morse code is that important and if that is what we are going to have to depend upon when the atom bombs fall (for communication), I don't see any other choice but to make sure that every amateur is *very, very* good at Morse code. You don't really have any choice.

You've *got* to be good at it because you're going to have to handle millions of messages. You're going to have to handle an *incredible* amount of messages.

I've just made a note of a few of them. You've got to handle traffic about radiation and where the detectors are, military communications, law and order communications, food, water, shelter, clothing, medical help, medical supplies, evacuation, toilet facilities, power, getting equipment around where it is needed, travel communications, and so forth.

You've got an enormous amount of things you're going to have to handle.

Anybody who has done emergency communications knows what I am talking about. You are immediately overloaded enormously and hams have to work 36 hours at a time without stopping and they still fall way behind on trying to keep up with *minor* emergencies. And we're talking about—now—when the chips are down. We're talking about being able to supply emergency communications in case of nuclear attack. And we can't *plan* for anything *less*.

We have painted ourselves into a corner that we can't get out of on that. There is no way that we can provide even a fraction of what is needed. And we have stopped ourselves from essentially being able to do anything about it.

What *could* we do? We could start working toward high-speed digital communications with little units maybe a third the size of the Model 100, where you can write messages. And we can have our repeaters so they relay them automatically, as I said before. And all of this, if we have enough *hams*, will be done very inexpensively, will be done with single chips.

Think of the communications facility we would have if you could pick virtually anybody that you wanted to talk with and write a message to him and have it automatically delivered. It would be a different kind of amateur radio.

If we tuned 15 meters and every time you came across a signal, the call letter flashed on your transceiver on a little readout because he's sending his call automatically on a subcarrier at high speed...and it would read out and you could tune, you could have, you could punch in on your keyboard, the prefix that you're looking for. You could work all 350 countries in alphabetical order [chuckles]—in a day, if there's a few DXpeditions out there. And at the DXpedition, all you have to do is send the box and have an automatic flip-up antenna at the post office. [Guffaws.] And have a little chip in there that prints out the awards certificate when you contact the station automatically. [Guffaws.]

Well, I joke about it, but it isn't that far off. We *could do that.* And *indeed*, if we *don't* have a *system* that can handle that quantity of communications and do it *automatically* and not insist on having a *skilled* operator present, we're not going to be able to provide the communications that are needed.

Now, it's up to us to design equipment, to buy it, make it

work, and have it ready, but it should be capable of being operated by anybody.

Questions

Just one comment: Sixty million is kind of Mickey Mouse, isn't it? I don't know, it seems kinda good. [Guffaws.] I haven't had any emotional problems with it. [More.] I guess the main people who have had emotional problems with it are the people around me because I haven't changed much. I still live in a one-room apartment over my office and everybody says, "Gee, you're so wealthy, you should have an estate and everything like that." It isn't that bad. Yeah?

Yeah, you talked about in one of your editorials about liking all these gadgets. I just wonder how you fit them all in?

Well, fortunately the gadgets that I like are all very small. And it's not that much of a problem. Everything is, you know, they're all small. I'm a gadget fanatic—but, very few large gadgets. Yes?

You're still the owner of 76, aren't you?

Pardon me?

You still own 76?

73? No, I sold *73*. I am still the publisher and president of the corporation but it is *owned* by IDG. And we changed the name of it to CW Communications in honor of Morse Code. [Guffaws.] You notice my little key up here. [Gold lapel pin.]

. . . I thank you all very much for coming. If you have any further questions, come up here and ask them. [Applause.]

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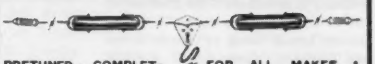

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RG11U 96% shield, 75-ohm mil spec . . . . . 25¢/ft.
RG8U 96% shield, mil spec . . . $29.95/100 ft. or 31¢/ft.
RG6A/U double shield, 75-ohm . . . . . 25¢/ft.
RG58AU stranded mil spec . . . . . 12¢/ft.
RG58 mil spec. 96% shield . . . . . 11¢/ft.

LOW LOSS FOAM DIELECTRIC

RG8X 95% shield . . . . . $14.95/100 ft. or 17¢/ft.
RG59U 70% copper braid . . . . . 9¢/ft.
RG8U 80% shield . . . . . 18¢/ft.
RG58U 80% shield . . . . . 07¢/ft.
RG58U 95% shield . . . . . 10¢/ft.
RG59U 100% foil shield, TV type . . . . . 10¢/ft.
RG8U 97% shield 11 ga. (equiv. Belden 8214) . . . . . 31¢/ft.
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CONTESTS

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VENEZUELAN INDEPENDENCE WORLDWIDE CONTEST

SSB
Starts: 0000 GMT July 7
Ends: 2400 GMT July 8
CW
Starts: 0000 GMT July 28
Ends: 2400 GMT July 29

The Radio Club of Venezolano invites all amateurs to participate in the 22nd year of the Venezuelan Independence Worldwide Contest. Use all bands, 80 through 10 meters. Operating classes include: (a) single operator, one band (for each band); (b) single operator, multiband; (c) multi-operator, multiband, one transmitter; (d) multi-operator, mulitband, multi-transmitter.

EXCHANGE:

RS(T) plus a three-digit QSO number starting with 001.

SCORING:

Contacts between stations of different countries count two points. Contacts with stations within one's own country do not count but are valid as multipliers for each band. Count one multiplier for each Venezuelan and USA call area and each country (including own) worked on each band. Use the ARRL DXCC country list. Final score is the total QSO points times the total multiplier points.

AWARDS:

For stations outside Venezuela, there will be a plaque to the highest scorer in each class. Medals to the highest scorer in each continent and among the Bolivarian countries (Bolivia, Colombia, Ecuador, Panama, and Peru) in the single-operator, multiband class. Certificates to all stations in the Americas working 15 YV stations and 10 different countries, all European and African stations working 10 YV stations and 10 different countries, and all Asian and Oceanic stations working 5 YV stations and 10 different countries.

ENTRIES:

Logs must show date and time in GMT, station worked, reports exchanged and respective numerical order, multipliers, and points. Use different sheets for each band worked. Include a separate summary sheet showing name(s) of operator(s), callsign, and address. Each participant must include $2.00 US or IRC equivalent with their logs. Entries must be postmarked no later than August 15 for SSB and September 15 for CW and should be addressed to: RCV, PO Box 2285, Caracas 1010-A, Venezuela.

INTERNATIONAL WORLDWIDE DX SSTV CONTEST

Starts: 0000 GMT July 13
Ends: 2400 GMT July 15

Official rules were not received prior to press time, so I assume there are no major changes from last year.

This is the third annual DX SSTV contest sponsored by *A5 ATV Magazine*. This is a 48-hour SSTV video contest using 80 through 10 meters within the recommended SSTV calling/operating frequencies listed below. To encourage allband contest usage and promotion, extra bonus points are granted on the 10-, 15-, 40-, and 80-meter band segments. Single-and multi-operator stations are recognized, with crossband contacts not permitted. Individual contacts count only once per band with repetitive multiband contacts acceptable.

Callsigns and video reports must be in "video" form. Mug shots of the station operator, family, or friends can count only once. Slower clock-rate speeds are encouraged in either 128 16.5-second or 256 31-second timebases. Color work must contain a minimum of a 2-color overlay to qualify with standard RGB frame transmissions. Motion SSTV must have a minimum of 2 frames sent with automatic-receive switching circuitry or manually-operated switching by the receiving operator and 64 × 64 "quadrant" storage of no less than 4 separate pictures with replays.

SCORING:

Each SSTV two-way contact is worth 5 points within the same country and worth 10 points for DX out of country. Contact bonus points are available as follows: mug shots—1 point, slow speed—2 points, quad frame—3 points, motion SSTV—4 points, high resolution—5 points, and color SSTV (RGB)—10 points.

A band multiplier of 3 can be claimed for contacts on 40 and 80 meters, 2 for contacts on 6, 10, and 15 meters. Stations with over 25 DX countries worked add 25 points, with 50 DX countries add 50 points, and with over 100 DX countries add 100 points!

FREQUENCIES:

Advanced/Extra—3835, 7220, 14230, 21340, 28660, 50.150.

General—3990, 7290, 14340, 21440, 28680, 50.150.

AWARDS:

First-place winner receives a 3-year subscription (worth $60.00) to *A5 ATV Magazine* with front-cover picture plus a Gold Certificate. Second- and third-place winners receive one-year subscriptions and Gold Certificates. All entries regardless of score receive Gold Certificates suitable for framing. Results will be in the November issue of *A5 ATV Magazine*.

ENTRIES:

Submission of logs and totaled scores must be postmarked no later than August 1 and submitted to: Contest Manager, *A5, ATV Magazine*, PO Box H, Lowden, Iowa 52255-0408. Logs will be returned as will any photos, etc.

IARU RADIOSPORT CHAMPIONSHIP

Starts: 0000 GMT July 14
Ends: 2400 GMT July 15

This contest is open to all licensed amateurs worldwide and several changes have been made since last year. The object is to contact as many other amateurs in as many parts of the world as possible using 1.8 through 148 MHz. Single-operator stations must not operate more than 36 hours of the contest period. Operating categories include:

(a) Single operator: phone-only, CW-only, and mixed-mode sections. One person performs all operating and logging functions. Use of spotting nets is prohibited. Off times must be 30 minutes minimum and single-operator stations are allowed only one transmitted signal at any given time.

(b) Multi-operator: single transmitter, mixed mode only. Only one transmitted signal allowed at any given time and must remain on a band at least 10 minutes at a time. All operators must observe the limits of their operator's license at all times.

Stations may be worked once per frequency band; crossmode, crossband, and repeater QSOs do not count.

EXCHANGE:

Signal report and ITU zone.

SCORING:

Count 1 point per QSO within your ITU zone, 3 points within your continent but different ITU zone, and five points with different continents. Multipliers are the number of ITU zones worked on each band. Final score is total number of QSO points multiplied by the sum of ITU zones worked on each band.

ENTRIES:

All entrants are encouraged to use forms available from IARU/ARRL Headquarters; send SASE or 1 IRC. Logs must indicate times in GMT, bands, calls, and complete exchange. Multipliers and off-times should be clearly marked in the

CALENDAR

Jul 1	**Canada Day Contest**
Jul 7–8	**YV Independence Worldwide Contest—SSB**
Jul 13–15	***A5* International SSTV DX Contest**
Jul 14–15	**IARU Radiosport Championship**
Jul 21–22	**SEANET Worldwide DX Contest—CW**
Jul 28–29	**YV Independence Worldwide Contest—CW**
Jul 28–30	**CW County Hunters Contest**
Aug 4–5	**ARRL UHF Contest**
Aug 5–6	**Illinois QSO Party**
Aug 11–12	**New Jersey QSO Party**
Aug 18–19	**SARTG Worldwide RTTY Contest**
Aug 18–19	**SEANET Worldwide DX Contest—Phone**
Aug 24–27	***A5* North American UHF FSTV DX Contest**
Sep 1	**DARC Corona 10-Meter RTTY Contest #3**
Sep 8–9	**ARRL VHF QSO Party**
Sep 15–17	**Washington State QSO Party**
Sep 22–23	**Late Summer QRP CW Activity Weekend**
Oct 6–7	**ARRL QSO Party—CW**
Oct 13–14	**ARRL QSO Party—Phone**
Oct 13–14	**Rio CW DX Party**
Oct 13–15	**Oregon QSO Party**
Oct 20–21	**Jamboree on the Air**
Nov 3	**DARC Corona 10-meter RTTY Contest #4**
Nov 3–4	**ARRL Sweepstakes—CW**
Nov 17–18	**ARRL Sweepstakes—Phone**
Dec 1–2	**ARRL 160-Meter Contest**
Dec 8–9	**ARRL 10-Meter Contest**
Dec 26–Jan 1	**QRP Winter Sports—CW**
Dec 30	**Canada Contest**

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EXCITER

NEWSLETTER OF THE MONTH

This month's winner, *The RARS EXCITER*, is edited by Ann Bradley WA4APK (ably assisted in May by Murray Hake W6MVZ). Packed with information of all sorts, it's another great example of excellence in ham radio journalism.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

logs. Cross-check sheets are required if more than 500 QSOs total are made. Entries must be postmarked by August 15; any entry received after mid-October may not be in time to be included in the printed results. Usual conditions of entry and disqualification apply. Entries should be addressed to ARRL Headquarters in Newington, Connecticut.

AWARDS:

A certificate will be awarded to the high-scoring CW-only, phone-only, mixed-mode, and multi-operator entrant in each ARRL section, each ITU zone, and each DXCC country. In addition, achievement-level awards will be issued to those making at least 250 QSOs or having a multiplier total of 50 or more. Additional awards may be made at the discretion of each country's IARU society.

SEANET WORLDWIDE DX CONTEST

CW

Starts: 0001Z Saturday, July 21
Ends: 2359 Sunday, July 22

Phone

Starts: 0001Z Saturday, Aug 18
Ends: 2359 Sunday, Aug 19

Use 160- through 10-meter bands. Entry classifications include (1) single-band, single-operator; (2) multiband, single-operator; (3) multiband, multi-operator. Power input is as stipulated in the regulations governing the licenses of the operator. The contest call is "CQ SEA" for the CW contest and "CQ SEATEST" for the phone contest.

EXCHANGE:

RS/RST report plus serial numbers starting with 001 and increased by one for each successive contact. See also Rule 3(d).

SCORING:

1) For stations outside the SEANET area:

(a) Contact with stations within the SEANET area of the following prefixes (DU, HS, YB, 9M2, 9M6, 9M8, 9V1, V85)—20 points on 160 meters, 10 points on 80 and 40 meters, and 4 points on 20, 15, and 10 meters.

(b) Contacts with other stations within the SEANET area not listed above in 1(a)—10 points on 160 meters, 5 points on 80 and 40 meters, and 2 points on 20, 15, and 10 meters.

(c) Contact between stations outside SEANET area will not be counted.

(d) Multipliers will be 3 points for each country worked, i.e., for countries between SEANET areas only.

2) For stations in the SEANET areas:

(a) Contacts with stations outside SEANET areas—10 points on 160 meters, 5 points on 80 and 40 meters, and 2 points on 20, 15, and 10 meters.

(b) Contacts between stations within the SEANET areas—6 points on 160 meters, 3 points on 80 and 40 meters, and 2 points on 20, 15, and 10 meters.

(c) Contacts between stations in own country will not be counted.

(d) Multipliers—contacts with countries within the SEANET area count 3 points for each country worked.

3) The final score will be the sum of the *points* multiplied by the sum of the *country multipliers*.

The list of SEANET area prefixes is as follows: A4, A5, A6, A9, AP, BV, CR9, C21, DU, EP, HL, HS, H44, JA/JE/JF/JG/JH/JI/JR, etc., JD1, JY, KA, KC6, KG6/KH2, KH6, KX6, P29, S79, VK, VQ9, V85, VS6, VS9K, VU2, XU, XV5, XWB, YB, YJ8, ZK, ZL, 3B6/7, 3B8, 3D2, 4S7, 4X, 5W1, 5Z4, 8Q7, 9K2, 9M2, 9M6/8, 9N1, and 9V1.

Some restrictions apply, as follows:

(a) Contacts on cross-modes or cross-bands or mixed CW/phone logs will be disqualified.

(b) Operators are not allowed to transmit two or more signals at the same time.

(c) Only one contact per band with the same station will be counted.

(d) Contest numbers should begin with 001 on each different band.

(e) All entries in violation of the contest rules, incorrect statements in the submitted reports, taking points from duplicate contacts, and practices against the brotherhood of amateur radio will be disqualified.

(f) The decision of the SEANET Contest Committee shall be final.

ENTRIES, LOGS, AND SUMMARY SHEETS:

All entries must be in the form of logs and summary sheets. All time must be in GMT. Entries must be received by the Contest Manager, Eshee Razak 9M2FK, PO Box 13, Penang, Malaysia, not later than October 31, 1984. Results will be announced at the SEANET Convention. If you require the results to be sent to you, please enclose IRCs together with your entry.

CW COUNTY HUNTERS CONTEST

Starts: 0000 GMT July 28
Ends: 0200 GMT July 30

The CW County Hunters Net invites all amateurs to participate in this year's contest. All mobile and portable operation in less active counties is welcomed and encouraged. Stations may be worked once on each band and again if the station has changed counties. Portable or mobile stations changing counties during the contest may repeat contacts for QSO points.

EXCHANGE:

QSO number; category (P for portable, M for mobile); RST; state, province, or country; and US county. Stations on county lines give and receive only one QSO number, but each county is valid for a multiplier.

FREQUENCIES:

3575, 7055, 14065, 21065, 28065. It is strongly requested that only P or M category stations call CQ or QRZ on 40 meters below 7055 and on 20 meters below 14065 with all other stations spreading out above those frequencies.

SCORING:

QSOs with fixed stations are 1 point; QSOs with portable or mobile stations are 3 points. Multiply the number of QSO points times the number of US counties worked. Independent cities may be counted as any one of their adjoining counties in accordance with USACA rules. Mobiles and portables calculate their score on the basis of total contacts within a state for state certificate and calculate their scores on all operations if they operated from more than one state in competition for the High Portable or High Mobile Trophy.

AWARDS:

Certificates will be awarded in three categories:

1) Highest fixed or fixed portable station in each state, province, and country with 1,000 or more points.

2) Highest station in each state operating portable from a county which is not his normal point of operation with 1,000 or more points.

3) Highest station in each state operating mobile from 3 or more counties with a minimum of 10 QSOs in at least each of 3 counties.

Plaques will be awarded to the highest mobile and portable stations in the USA that meet the above requirements for certificates. Additional awards will be issued where deemed appropriate.

ENTRIES:

Logs must show category, date/time in GMT, station worked, band, exchanges, QSO points, location, and claimed score. All entries with 100 or more QSOs *must include a check sheet of counties worked or be disqualified from receiving awards.* Enclose a large SASE if results are desired. Logs must be postmarked by September 1 and sent to: CW County Hunters Net, c/o Jerry Burkhead N6QA, 7525 Baltic St., San Diego, California 92111.

•••••

I recently received a letter from the Yukon Amateur Radio Association concerning VY1 participation in future contests. As a result of a recent group meeting, they are requesting separate multiplier status for the Yukon Territory, VY1, for the following reasons:

1) In most contests, Yukon and Northwest Territories are classed as one. The Yukon has no ties with VE8, political or otherwise. The VY1 prefix has been in existence for 6 years now, although most publications still think they are either South America or Sable Island.

2) It is discouraging to have many VE and W amateurs call and have no idea where the VY1 station is located, especially since most contest information still lists them as VE8.

3) There are no super stations in the Yukon. With the propagation anomalies they suffer at that latitude, they cannot compete with southern stations. They are relegated to just being on during the contest period for the sake of giving out the prefix.

4) They have made an effort to have at least 3 stations on in every major contest for the past 2 years. The main participants have just had about enough and are seriously considering following their preferred methods of operating rather than spending complete weekends operating contests without any hope of turning in reasonable scores.

I think the letter speaks for itself and future contest chairmen may want to reconsider their multipliers!

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4-BAND SLOPER	160, 80, 40, 30, or 20M	60 ft. long	$ 48 ppd
3- "	"	160, 80, 40M	60 ft. "	$ 43 "
2- "	"	80, 40M	40 ft. "	$ 35 "
9-BAND SPACE-SAVER DIPOLE	160 thru 10M in 40 ft.		call/write
3- "	NO TRAP DIPOLE	160, 80, 40M	113 ft. long	$ 66 ppd
2- "	"	"	80, 40M	85 ft. "	$ 49 "
2- "	BROAD-BAND DIPOLE	80, 40M 90 to 130 ft.	"	$ 48 "

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NEW PRODUCTS

AMATEUR RTTY/ASCII/CW TERMINAL

ColoRadio Research, based in Loveland, Colorado, has announced the Model 900B Advanced Keyboard, a totally expandable amateur-radio RTTY/ASCII/CW terminal. It can be interfaced to a variety of computers via its RS-232C port and can be expanded to include a high-quality built-in keyboard, 16-character LED display, and/or 80-character-by-25-line high-resolution video interface.

The unit sends and receives Baudot and ASCII codes at all standard baud rates from 45 to 110 and can transmit at up to 1200 baud. The RS-232C port can handle up to 9600 baud with CTS/RTS, Xon/Xoff, or no handshaking.

The Model 900B also has CW transmit and receive capability. The ColoRadio Surecopy I algorithm automatically adjusts to any incoming speed within a few letters and the hardware and software signal processing minimizes garbled copy under even the worst band conditions.

Other functions include dupe-checking of up to 1280 calls, and touchtone™ and two-tone transmitter testing. The output *and* input tone frequencies can be changed at any time in 1-Hz steps, giving compatibility with not only current shifts of 170, 425, and 850 Hz, but also modem shifts of 200 Hz and any future shifts that may be used.

The unit interfaces easily with any amateur-radio station, with connectors for audio input and output, FSK, loop, autostart, key in, positive and negative key outputs, and video. A unique feature is the ability to multiplex the station microphone through the Model 900B to avoid having to switch cables when going from RTTY to SSB (useful on older transceivers that don't have separate mike and AFSK jacks).

Standard features include an 800-character type-ahead transmit buffer with break capability and buffer recall "pointers" that give an effective transmit-buffer capacity of 64,000 characters, ten 80-character message buffers, an 80-character WRU buffer, CW ID capability, 10,000-character receive buffer with scrolling, split- and full-screen display, complete status indications showing date/time, word mode, brag-tape status, diddle, sidetone, column number of automatic carriage return/line feed, operating mode, speed, tuning indicator, USOS, polarity, and frequency of transmit and receive tones. The dupe-check function has nicad battery backup to allow the user to return home from field contests and dump the stored calls to a computer or printer.

Inquiries should be mailed to *ColoRadio Research, PO Box 603, Loveland CO 80539; (303)-667-7382.* Reader Service number 477.

MICROCOMPUTER LOGGING PROGRAM

Crumtronics has announced Contender, a logging program for the Commodore 64 microcomputer.

On a single-sided disk you can enter 2,000 entries, allowing callsign, RST sent/received, time/date (auto or manual), name, QTH, zone, and QSL information for each entry. Contender permits forward/reverse scan, has an edit/update feature, and allows you to PRINT: dupe sheet to printer or screen, QSL labels, QSL cards, and complete log.

Contender is being expanded to include allband WAS, WAZ, DXCC, and state/county report. The expanded version will be known as Contender Plus and will be priced slightly higher.

For more information, write to *Crumtronics, Software Division, PO Box 6187, Fort Wayne IN 46896; (219)-745-0350.* Reader Service number 481.

IC-37A 220-MHZ MOBILE

Icom has announced the IC-37A 220-MHz compact mobile transceiver. The IC-37A features:

IC-37A mobile transceiver.

- 25 Watts/5 Watts low
- same design as IC-27A—5½" W × 1½" H × 7" D
- 32 PL frequencies—standard, built-in
- 9 memories with offset and PL storage
- dial steps: 10 kHz/5 kHz
- memory scan, band scan, and priority scan
- dual vfo's
- HM-23 touchtone™ and scanning mike standard
- speech-synthesizer option
- Nor/Rev switch

For more information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

The unit is small, measuring 6.9" H × 11" W × 14.6" D. It weighs just under 16 pounds.

Ac voltage is selectable: 100, 115, 215, or 230 V, 50 or 60 Hz. Power requirements are approximately 40 VA.

Applications for the 5060 include computer field servicing, industrial control, process control (e.g., the paper industry), food processing, and assembly lines.

"It fits two niches nicely," explained Bill White, vice-president of marketing for Kikusui. "One is field service where light weight is a prime consideration, and the other is production lines where KIK's automatic triggering simplifies and speeds operation."

For more information, contact *Kikusui International Corporation, 17819 S. Figueroa St., Gardena CA 90248; (800)-421-5334.* In Alaska, California, and Hawaii, call *(213)-515-6432.* Reader Service number 476.

60-MHZ SCOPE FROM KIKUSUI

A new 60-MHz oscilloscope, featuring peak-to-peak automatic triggering and automatic focus was recently added to Kikusui's line of oscilloscopes.

Other key features of the scope, model 5060, include delay sweep, delay line, alternate sweep, a third channel signal, and a vertical-signal output on the back of the unit. Sensitivity is 1 mV with 5× magnification. The scope also includes a sync separator as standard.

In addition, a variable hold-off allows precise adjustment of trigger hold-off time, ensuring stable triggering on complex or long waveforms. Auto triggering and peak-to-peak auto triggering, on the other hand, ensure stable triggering at all input amplitudes. The built-in delay line allows accurate leading-edge measurements. Also, a two-channel X-Y operation is included.

The CRT of the 5060 is a 6" rectangular with 12 kV of accelerating potential to provide a clear, bright display, and automatic focus even when intensity is adjusted or the sweep rate is changed.

CONFINED E-FIELD DISPLACEMENT ANTENNA

Moler Antenna has produced a 16-foot, 80-meter vertical that enables any radio amateur to operate with a big signal from a small lot. It is motor-tuned at the loading coil to cover the whole band from 3.5 to 4.0 MHz. Fed with 50-Ohm coax, it handles the legal limit plus some and can be ground- or roof-mounted. The antenna is top-loaded with both inductance and a top capacity hat. The loading coil is wound with 3/8-inch-wide copper strap and the capacity hat has a diameter of approximately 8 feet. When ground mounting, a radial system of approximately 32 wires, about 25 feet long, is recommended. For mounting above the ground, at least 8 radials about 25 feet long, are recommended. The antenna requires 3 guy ropes. The assembly time is about 30 minutes. The loading coil motor is a 12-volt-dc reversible motor and can be driven easily by a 9-volt tran-

RTTY/ASCII/CW terminal from ColoRadio Research.

60-MHz oscilloscope from Kikusui.

sistor-radio battery. You can build your own control box or buy one from Moler. This antenna has a low wave angle, therefore, it works very well on DX. Two or more of these antennas can be phased easily by driving only one and using the others as parasitic elements, steering the beam in any direction by remotely tuning the mutually coupled antennas.

A conversion kit is available for the above antenna. It converts the 80-meter vertical to half-wave vertical. The conversion kit eliminates the need for radials and increases the height of the antenna by 3 feet (making the overall length approximately 19 feet). For more information, contact *Moler Antenna Corp., 2623 Morris Lane, Girard OH 44420; (216)-530-2059.*

HF ANTENNA DESIGN PROGRAM

HF Antenna Design is the latest offering in Cynwyn's software series for amateur-radio hobbyists. The program makes the necessary calculations for building three popular types of antennas—dipole, yagi, and quad—for frequencies of 1.8–30 MHz and displays them in an easy-to-read tabular format. Dimensions for the yagi and quad are optimized for maximum gain.

HF Antenna Design requires a TRS-80C Color Computer with 16K RAM and Extended Color Basic or an MC-10 with 4K RAM.

For more information, contact B. E. Wynkoop at *Cynwyn, 4791 Broadway, Suite 2F, New York NY 10034; (212)-567-8493.* Reader Service number 479.

NCG'S NEW TRIBANDER

The new tribander, 40–15 plus 6 meters, will give all amateurs, from Novice to Extra, a rig that will fill the gap. The 7-21-6M is all solid state with built-in ac/dc; no external power supply is needed. Full band coverage on 40 and 15 meters with 6-meter coverage from 50.0 to 50.50 MHz. All bands operate in the modes of SSB or CW. Drift-free operation is less than 100 Hz. Two antenna connectors allow band-switching easily, one is for 6 meters and the other is for 15 and 40 meters. Transmitting final stage is 26 Watts PEP and modulation is a balanced type. Carrier suppression is more than 40 dB down. Microphone impedance is from 50 to 400 Ohms. With built-in TVI suppression for 6 meters, this tribander will be a pleasure to operate. With a slow swr on the 6-meter antenna, no or very little TV interference will be encountered. The 7-21-6M is an ideal transceiver for the Technician, phone on 6, and CW on 15 and 40 meters. The tribander is small enough to operate mobile and large enough for a base rig. The tribander should be available in July. For additional information, contact *NCG Co., 1275 N. Grove St., Anaheim CA 92806; (714)-630-4541.* Reader Service number 478.

SHACKMASTER

Advanced Computer Controls, Inc., has introduced ShackMaster, a new product which allows you to remotely control your shack and effectively communicate with family members over your home equipment.

ShackMaster's crossband linking capability allows you to access your high-performance home station from VHF/UHF, either simplex or through repeaters. Telephone access permits remote control of your home station from any touchtone™ telephone. BSR X-10 shack control offers touchtone remote control of 120-volt devices with touchtone commands, over the air or over the phone.

ShackPatch, a remotely controlled intercom into the home, permits you to remotely control your home equipment, allowing third parties to participate. ShackPatch is based on the same principles as an autopatch, and you are in complete control of your station at all times. An electronic mailbox permits you and your family to leave messages for each other, to be retrieved when convenient. Finally, a simplex autopatch is available when it's necessary to make a phone call, report an accident, or call a friend.

ShackMaster is based on ACC's proven repeater control technology. It includes electronic synthesized speech with a custom vocabulary. It interfaces to up to three transceivers, the phone line, and a local speaker and microphone.

For more information, contact *Advanced Computer Controls, Inc., 10816 Northridge Square, Cupertino CA 95014; (408)-749-8330.* Reader Service number 480.

MODEL CS-16 TOUCHTONE DECODER

Connect Systems, Inc., has introduced a low-cost, 16-function touchtone™ decoder board. Designated as model CS-16, the decoder will securely control virtually any apparatus via radio or wire. The CS-16 is especially useful for controlling various repeater on/off functions.

One feature of the CS-16 is dual password control. Two separately user-programmable three-digit passwords create heirarchy control capability. The primary control password can access all 16 of the available functions. The secondary password, however, can access only 8 of the 16 functions. Additionally, a special primary password command is available which can enable or disable secondary password access. The CS-16 provides such a high degree of multi-level security that control can be accomplished directly on voice channels thus eliminating the need for separate control frequencies.

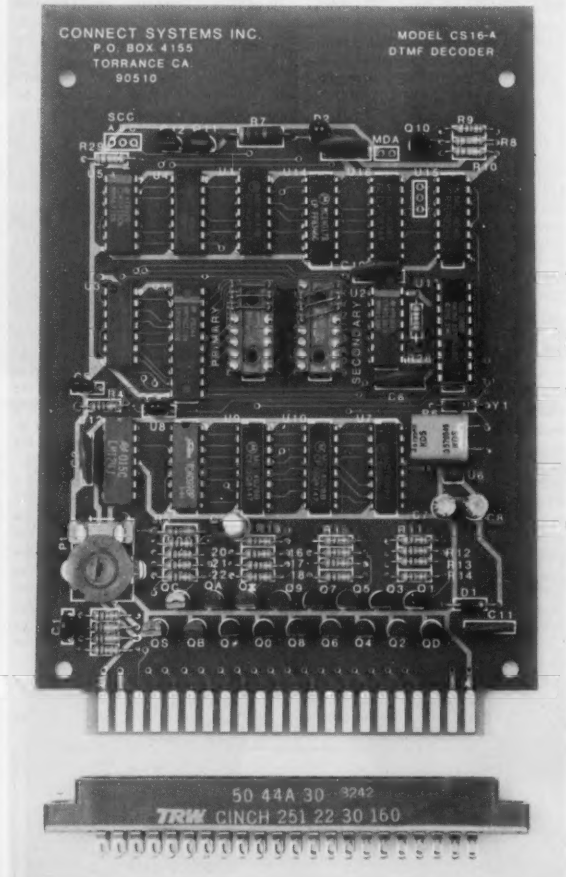
The CS-16 provides 16 independently controllable on/off latched functions. Each function is provided with an open collector and a 5-V CMOS logic output. A strobe output is also made available in open collector and logic format. This output can be used to gate repeated audio so that DTMF control commands are not retransmitted—a further security enhancement.

A power-up reset feature causes all outputs to be in the off state after application of power. An audio preamp with level control permits the crystal-controlled tone decoder to operate over the wide input range of 10 mV to 2 volts. A strobe LED lights when any of the 16 buttons on a pad is pressed. (The CS-16 can also be used with 12-button pads.) An on-board voltage regulator permits operation with a 10–25-V-dc power source. The CS-16 incorporates reverse polarity protection and draws less than 20 mA from the supply.

The CS-16 is constructed on a top-quality glass board with plated-through holes. The board is reflow-soldered and machine-trimmed. The 44-pin edge connector is gold plated for extreme reliability. The CS-16 is supplied with mating connector, manual, and limited six-month warranty. For more information, contact *Connect Systems, Inc., 23731 Madison St., Torrance CA 90505.*

ShackMaster from ACC.

NCG's new tribander.



New touchtone decoder from Connect Systems.

REVIEW

THE SUPER SANTECS—EVEN BETTER NOW

In last October's issue of *73*, I reviewed the Santec ST-/uP series of handie-talkies in glowing terms. Since then the importer, Encomm Inc., has introduced substantially updated versions of all three radios. The ST-144/uP, ST-220/uP, and ST-440/uP have been replaced by the ST-142, ST-222, and ST-442.

The good news is that, good as the earlier versions were, the new ones are better. The really good news is that Encomm hasn't forgotten all you buyers of ST-/uP radios: For a cost considerably less than that of a new radio, they will update your ST-/uP into the new model, as they have done for all three of mine. I can't remember any manufacturer/importer having done that before.

The changes in the new models affect the microprocessor operating system. The transmitter and receiver are unchanged, and both have the excellent specs that were published in my October review.

Programmable Offset

What's different? A whole lot. First and foremost, the transmit offset is now separately programmable on all ten channels! Think about that. If you use odd-split repeaters, or if you want to listen on your repeater's output but transmit on a control frequency, you can set up a channel memory for that purpose. In the ST-/uP radios, you could set up one, and only one, "special" offset, by receiving on the set frequency and transmitting on the frequency stored in memory 1. Now you can have a different offset in every memory channel if you want it! You can also use the variable offset feature in the "normal," i.e., non-memory, mode, and it will apply to whatever receive frequency you program in.

The offset is variable in 10-kHz steps (25 kHz on the ST-442), the maximum offset is 9990 kHz (9975 kHz on the 442), and the minimum offset is twice the minimum adjacent channel step (meaning 10 kHz minimum offset on the VHF radios and 50 kHz on the UHF one). Bear in mind that if your offset results in an out-of-band transmit frequency, nothing will happen when you press the push-to-talk bar.

If all this versatility isn't enough for you, as might happen if you wanted an offset not divisible by 10 kHz, the "old" setup of receiving on a selected channel and transmitting on a frequency stored in a "special" memory is still available. Memory 9 has replaced memory 1 for this purpose.

Programmable CTCSS

Still on the subject of "customized" channels, Encomm is offering a programmable CTCSS encoder for the new radios that will allow you to generate a different subaudible access tone on each of the memory channels. The encoder uses a PROM that you customize yourself. If you buy this accessory, you also get a little programming board which takes the PROM and uses any 12-V-dc source to program it as you desire. Then all you have to do is select the channel you want, and the correct transmit offset and subaudible tone frequency are right there automatically.

Status Memory

Variable offset and custom access tones are just the beginning. When you turned the ST-/uP radios off and then on again, they "woke up" on whatever frequency was stored in memory 1, but in "normal" (i.e., not memory) mode. This meant that when you finished a QSO and shut down the radio, then remembered you had something else to say, you would have to reselect the channel on which you had been talking (unless it happened to be the one in the first memory). No more! The new Santecs "wake up" in *exactly* the status they were in when you shut down—on the same memory channel or on the same normal mode frequency, whichever way you had it set up when you switched off. Incidentally, this eliminated the "bug" mentioned in last October's review, which related to use of the clock (yes, the clock is still there). Sometimes when I switched to the clock mode and back to the frequency display, I found the radio on the memory 1 frequency in normal mode, as though I'd shut off the power and turned it on again. That no longer happens, because interrupting the power doesn't affect the frequency/memory settings.

Scan Lockout

We're still not finished with the goodies list. On the ST-/uP radios, you could scan all or a set part of a band or you could scan the ten memories, with a priority feature for the memory 1 frequency. If you were scanning memory channels, you had to scan all ten, and the radio would stop on each one that was active. This meant that if you had programmed in, say, your three favorite repeaters, and six or seven more that you used only occasionally but wanted to have available, the radio would stop scanning on the less-interesting channels if they were in use, which introduced some delay in getting to the stuff you really wanted to hear.

Problem solved. The new radios have a "lockout" feature which can be applied to any channel. Select that channel, turn the "memory write" switch on, and press the "B" key. A small "L" lights up next to the frequency display, and that channel is locked out of the scan until you cancel the lockout. The locked-out channel is still available by keyboard selection, of course—it just won't show up in scan mode.

New "Open"ing

Speaking of scanning: Have you ever made use of an "open" scan feature which lets you scan for a quiet channel? In theory it's a nice idea, but in a country with a lot of repeaters, it isn't too useful. I can't ever recall using it, although all three of my ST-/uP radios had it.

Well, I'm going to start using "open" scan now, because on the new Santec radios it isn't what it used to be. First, a quick refresher course in Santec scanning is in order. You had (and still have on the new radios): "MAN"ual scanning, one frequency step for each press of the "up" or "down" keys, continuous if you hold either key for a second or so; "SCAN," stop on each busy channel, auto restart after 6 seconds or so; and "SRCH," stop on a busy channel, no auto restart. The new "OPEN" mode stops on each busy channel, but auto restart is delayed until the channel has been quiet for a few seconds. Using "OPEN," you can hear a QSO out to its finish, and then the radio will resume scanning. That's a useful feature, and to my mind much more so than the ability to scan for a quiet channel. Remember also that all the Santec radios have variable scan interval—5 to 100 kHz for the VHF units, 25 to 100 kHz for the ST-442.

Accident Prevention

On the ST-/uP radios, some care had to be exercised when programming memories. You set up the receive frequency on the display, set the offset switches the way you wanted, turned on the "memory write" switch, pushed the "write" key, and entered the desired channel digit. The problem was, if you accidentally pressed a second digit before turning off the write switch or pressing the write key a second time, the same frequency got written into another memory. Several times I forgot this, went into the "memory write" mode, and then entered the frequency I wanted. If I entered "673" (for 146.730 MHz), I got whatever frequency was on the display entered into channels 3, 6, and 7—overwriting anything that had been there before!

The new radios eliminate this problem. The act of storing a frequency in a memory channel automatically takes the microprocessor out of the write mode. The worst that can happen is that you get one wrong frequency stored, not three or four. A big improvement.

The new radios are identical in their external details to the earlier versions. The only obvious difference is the nameplate, which carries the new model number.

Updating Available

I said earlier that Encomm will update your ST-/uP radios. At his writing, the updating charge is $100—a lot less than the cost of a new radio. Your updated version will be identical in all respects to the new models and will accept the accessory programmable tone encoder. So you can have your ST-/uP made over into "this year's" radio instead of trading in the old one. Encomm hasn't abandoned you.

If you liked the ST-144/uP and its cousins, you'll love the ST-142.

For further information, contact *Encomm, Inc., 2000 Avenue G, Suite 800, Plano TX 75074; (214)-423-0024.* Reader Service number 482.

Robinson Markel W2IVS
New York NY

ICOM'S IC-RP3010 70-CM REPEATER

In our efforts to escape from the crowded metropolitan-area 2-meter band, our club sought refuge on 440 megahertz. Such a move in a heavily populated area is fraught with its own perils. Our repeater site on top of a high-rise apartment building provides excellent coverage, but many of the commercial operators in the area have had similar feelings and installed (more than 20) commercial repeaters within several hundred feet of our site.

It was a difficult decision to select a repeater that would be cost-effective and yet sufficiently selective to be able to cut the mustard. A modern commercial repeater was out of the question because of cost, and the older commercial variety used by many of the other 440 groups in our area required PL™ to keep the intermod out.

The Icom IC-RP3010 seemed a likely candidate; however, we had difficulty obtaining any information on it. We finally decided that the Icom name and reputation was enough to go on and after some difficulty locating one in this country and arranging for its shipment, we were pleasantly surprised when we opened our new package.

The repeater cabinet is constructed of heavy-gauge metal and is completely shielded on both top and bottom. Both the transmitter and the receiver are mounted in rf-tight boxes with quick disconnect plugs to enable easy removal for service. The power supply has a trickle charger to keep a backup battery fully charged for emergency power, and the power-on light, normally green for ac operation, changes to red to warn of battery power. A large heat sink the entire width of the cabinet is installed on the rear to dissipate heat generated by the power supply and PA.

The controller, CTCSS, and touchtone™ decoder boards are mounted underneath the main chassis. The front panel of the repeater is anodized aluminum, very attractively finished with an easy-to-follow block diagram of the repeater controls embossed on its face. Volume and squelch, CTCSS on-off, transmitter inhibit, manual ID, and COR simulate are the only external controls on the repeater. Annunciator lights make it easy to determine the mode and status of the repeater. It is 19" rack width, but the mounting holes are metric and may not line up with all US racks (possibly requiring rack modification by drilling new holes).

We bought the repeater with the optional Icom mounting rack which allows approximately 12" below the repeater for mounting duplexers or other accessories. It makes the repeater very attractive; thus far my wife has not objected to its being in our apartment, where it serves as a table.

The repeater comes from the factory aligned on a Japanese repeater frequency in the 430-megahertz portion of the band, so our first step was to install the crystals we had previously ordered for our assigned frequency and then retune the transmitter and receiver. The Icom manual contains detailed instructions on all alignment procedures. However, as in most manuals translated from the Japanese by non-native-English-speaking writers, some of the instructions require a little careful thought before execution. The receiver and transmitter both tweaked up well within Icom specs. Squelch on the receiver opened at 0.1 microvolts, and the transmitter produced 14 Watts.

The control board "brain" is a factory-programmed EPROM which contains the settings for all the timers with the exception of the squelch tail and the repeater callsign. The EPROM must be returned to Icom to have the repeater callsign programmed in ROM. Perhaps Icom could make some arrangement to program the EPROM and tune the transmitter and receiver on the user's frequencies at the

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

factory before shipment so that the entire repeater would become a turn-key operation.

The machine is now up and running and producing excellent results. We are running it without a power amplifier, using Wacom WP-678 cavities, and are currently using about 115 feet of hardliner. The results have been excellent. The audio is typical Icom and is equal to or better than that of other repeaters. Intermod has not been a major problem and we have been able to operate with the CTCSS off with little intermod interference.

The CTCSS frequency tolerance seems rather broad, and mobile stations have been able to get in even if they were one or two codes away from ours.

The repeater comes with single-digit touchtone™ control for repeater and CTCSS on-off, and we have found that the decoder frequently falses on voice modulation, thus turning the repeater or the PL™ on and off at inconvenient times. The single-digit decoder can be defeated by inserting an included jack on the rear repeater panel or by installing the IC-EX339 3-digit decoder available as an option from Icom.

Unfortunately, no provisions for installing an autopatch have been included. However, interfacing any commercial autopatch should be a rather easy job.

In summary, I feel the IC-RP3010 is an excellent piece of equipment well worth its purchase price. As soon as more become available, it is going to make the 440-megahertz band a popular place.

For further information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

Keith J. Mackey W4LDP
Ft. Lauderdale FL

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

As I write this column, this year's Greater Baltimore Hamboree and Computerfest has come to a close. It is amazing to describe the changes that have become apparent within amateur radio over the past several years, as viewed from the perspective of a hamfest.

Not that long ago, the bulk of dealers at these gatherings were selling big boxy transmitters or receivers, or tubes or other parts by the bin. As far as RTTY went, you could usually find a Teletype® Model 15 or two, or maybe a Model 28 if you were lucky, but not much else of especial interest to the RTTYer.

With the coming age of digital communications, all this has changed! This year, I would estimate the average distance between keyboards as under three feet, and that is allowing for the still considerable number of non-RTTY or computer items being displayed. Walking around this giant hamfest (which takes over the Timonium Fairgrounds, home of our Maryland State Fair, every spring) and pushing through the thousands of folks who braved a cold rainy day to come pointed up many sights.

I found RTTY bargains aplenty, ranging from rolls of paper at giveaway prices to one gent offering a Teletype Model 33 for all of ten dollars. Computer manufacturers have not forgotten us either, folks. Just about every table had a computer set up to either run RTTY or serve some other useful function in a ham shack. Yes, RTTY is more alive than at any time in its history. Hmm, there is a topic for a future column—the history of RTTY!

At any rate, included in this month's column are a few choice photos taken at this year's hamfest.

At the risk of inundating Levittown with mail, I have a note here, the contents of which I must pass along. As of the date of this writing (the first week of April), Fred Weidenhammer W4SDL/2 indicates that he has a Teletype Model 35-RO, free to someone willing to pay shipping and insurance. This is a receive-only ASCII printer, and it does not have a cabinet. That is all I know. I would suggest you contact Fred for further details at 332 Blacksmith Road, Levittown, New York 11756.

More comments on the various programs to run RTTY on TRS-80 Models I and III have arrived. Bill Buckingham WA3LIL, who has written us before on the subject, passes along the information that the programs he uses operate through the I/O bus of these computers with an I/O interface. The Model I has a forty-pin bus and the Model III a fifty-pin bus, so there are a few differences between them, but apparently they are not insurmountable. Bill also indicates that work is under way to adapt these programs to the new TRS-80 Model 4. Thanks for the information, Bill.

Along the same line, regards to Richard Ellers K8JKL of Warren, Ohio. Richard is trying to put his TRS-80 Model III onto RTTY and is looking for software. I have put Richard in touch with Bill and hope to see him on RTTY very shortly.

The outside tailgating area, showing mostly the rain and tents.

Duane Vincent KA7JEX from Seattle, Washington, passes along his comments with regard to running a Texas Instruments TI-99/4A on RTTY. Using one of the popular interfaces available, Duane is very pleased with this setup. He notes that the keyboard touch on the 99/4A is not unlike that of the IBM terminal he uses at work.

Duane has also used a VIC-20 on RTTY. He uses that computer for portable RTTY out of his van. Boy, that brings back a picture in my mind of a vehicular station set up locally some years ago by W3DTN, complete with a mobile Model 15! Well, Duane prefers the 99/4A keyboard to the VIC, but he likes to run the VIC on the mobile 12-V-dc battery power. Yes, sir, things are moving along!

Another Commodore patron is Allen Fugelseth WB6RWU. Allen is using a Commodore 64 computer and is looking for, as he puts it, "free or inexpensive software." Well, I have not seen anything that quite meets that description, but I will keep my eye out. Part of the problem, Allen, is that I try not to recommend products that I have not seen or that I have not received other detailed information about from a source other than the manufacturer. There have been a few "lemons" dangled in there with the other fruits and such, and I would rather avoid them if I can. Will keep you and the rest of the fan club posted on new software as the information arrives.

New members of the CoCo club include Bruce T. Brackin of Oklahoma City, Oklahoma, and Peter G. Pototsky NH6BF of Kailua, Hawaii. Bruce is an SWL with an interest in putting his CoCo to work receiving the RTTY he hears on the air. I have forwarded the information covered in the last few months here to him to help in these efforts. Bruce asks if I have noted any computer-generated rf problems as-

One of the highlights of the hamfest was a look at the FCC mobile monitoring van.

One of the indoor flea-market areas at the Greater Baltimore Hamboree.

sociated with the CoCo. He notes that his "Osborne I will tear the National (NC-400 receiver) to pieces, and just about anything else within about 100 feet of it." Well, Bruce, I have not noticed any RFI at all with the CoCo, and I think that is a tribute to careful attention being paid to those design features which minimize "leaks." I don't know why your Osborne is causing problems; I have several friends who are using theirs without interference. Would suggest you check out your grounding in the station to be sure that a floating ground or the like is not the culprit. Who knows, you may hear enough RTTY to want to get a license and join us!

Peter, when he is not basking on the beaches in Hawaii (do you know how miserable the weather in Maryland is this time of year?), is trying to put his CoCo on RTTY and would like a disk-based program to do it. Well, at this time, I know of no disk-based program that exists. I have indicated to Clay Abrams that upgrading his excellent tape program would be ideal, and he has related the intention of doing just that, but these things take time. In the meantime, you might drop Clay a line at 1758 Comstock Lane, San Jose, California 95124. Tell him that WA3AJR said to bug him for a disk program!

Well, response to my offer for some basic RTTY material has been gratifying. Therefore, I am now preparing a second edition of RTTY material. This stuff was covered here several years ago and is being re-presented for those who came in late, forgot it, or whatever. Issue number one dealt with the basics of RTTY data exchange; number two shall deal with the essentials of the RTTY code structure, primarily Murray and ASCII. These are several pages of information, offered at a cost of $2.00 each. If you would like either of these editions, just drop me a line at the above address and include a self-addressed, stamped envelope and $2.00 for each issue desired. I will continue to put more of this information together as time permits and demand persists.

DX

Chod Harris VP2ML
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DXING IN JULY

July. The lazy, hazy, noisy days of summer. High absorption batters down the higher bands, while summer thunderstorms fill the lower bands with deafening static crashes. Even the usually productive sunrise and sunset operating times are short and dull. Let's face it: July is not the best month for DXing.

So what's the DXer to do for the month of July? Take a month off from DXing? Maybe get to know the family again, before the bands start to pick up again in the fall? If you do that, of course, they'll start to expect you around the house, and it will be even harder to lock yourself into the radio shack for the start of the next DX season.

Fortunately, there are plenty of DX-related activities well suited to the dog (if not Dog X-ray) days of summer.

Antennas

The first thing that comes to mind is antennas. July offers an excellent time to review your DX-antenna farm. What worked last season? Will that antenna be good enough for the next DX season? With the decline of radio propagation, you might consider improving your low-band aerial hardware; 40, 80, and 160 meters will be hopping the next few winters. Meanwhile, the DX pickings on 10 meters will be few and far between. Even 15 meters will provide but sporadic excitement for the mid-80s. So think low bands, long dipoles, inverted vees, zepps, verticals, and ground planes.

If you are fortunate enough to have sufficiently tall, properly-spaced trees on your property, July is a good month to break out the bow and arrow or fishing rod and stick up a few wires and strings. So what if the neighbors think you're a little soft in the head, fishing in trees. Murmur something about flying fish and air sharks; they all think you're crazy to be a DXer anyway.

What kinds of antennas should you get up for the low bands? The bigger the better, of course, and height helps too. Vertical antennas seem to work better on the lower bands, if you can provide a reasonable ground. (We'll talk more about the low bands and DX antennas in a future column. Meanwhile, watch for bargains in lots of wire, and try to figure out how you are going to squeeze a 160-meter dipole onto your city lot.)

Paperwork Is Never Finished

DXers whose antennas are already big enough (if any) and those whose financial, environmental, or family circumstances preclude better antennas, might make use of the month of July by catching up on their DX paperwork.

Review your DXCC totals, QSLs sent and received, and your "need" list. The new DX-CC Countries List from the ARRL provides a good place to tally your present worked/confirmed totals. This multi-page pamphlet provides columns for all HF bands and for many of the other DXCC awards, such as RTTY bands and satellite. Three drawbacks with the new listing are: no spaces for new and changed countries within the listing, no place for band totals, and the cost—now $1.00 postpaid from ARRL.

Do you have any countries worked but not confirmed? Take some time in July to follow up those QSLs. If you wait too long to confirm after the contact, the chances of getting your card decrease. So, if you have cards outstanding to QSL managers and in other direct methods, see if a follow-up note might be in order. Of course, if you are awaiting cards via the QSL bureau, don't hold your breath; it might be years before you receive your cards.

If you do decide to send reminders or second requests for cards, check the current callbooks, QSL-manager lists, and DX bulletins for the most recent QSL information.

Two fortunate readers of the column can turn to their complimentary subscriptions to weekly DX bulletins (see this column, January, 1984). In the drawing held earlier this year, the awards and lucky readers were: *The DX Bulletin* (Box DX, Andover CT 06232) to John Holstead VS6HJ, and *QRZ DX* (Box 834072, Richardson TX 75083) to Ray Perkins KA2PSW.

Congratulations to both! And for the rest of you DXers who didn't win the free subscriptions, you can keep up with the day-to-day activities in the DX world by taking out your own subscription—see the address above. It's hard to have too much information in DX!

Another source of up-to-date DX information is your local DX radio club. Through meetings, newsletters, and DX-oriented repeaters, club members share ideas and locate the rare ones. And clubs provide assistance with Beam Teams and Quad Squads to repair damage from last winter's storms and put up even bigger aerial hardware.

These DX radio clubs depend on the interest, expertise, and enthusiasm of the members of the clubs. The club officers devote many hours of their time to provide programs, speakers, events, and camaraderie for the club. Too often when an officer asks for help with a club project, his efforts are rewarded with dead silence.

So, if you're not already a member of a local DX club, consider joining. If you are a member now, speak up the next time the club needs something done; help your fellow DXer. And if you already are active in your DX club, think about running for club office next time and share your energy to improve the DX world.

Among those who are doing just that are the officers of the very active Southeastern DX Club, centered in Atlanta, Georgia. Officers for 1984 include President Carl Hanson WB4ZNH, Vice-President Grover Meinert KC4BX, Treasurer Carol Shrader WI4K, Secretary Joel Levine WA4HNL, and Activities Chairman Jim Steible K4DLI.

The Western Pennsylvania DX Association's officers for 1984 are: President John Getz AD8J, Vice-President Phil Koch K3UA, Secretary Wayne Albert KB3KV, Treasurer Don McDanial KJ3Q, DX Information Chairman Denny Brantner KF3C, and (newsletter) Editor Mike Chepponis K3MC (see photo).

1984 officers for the Western Pennsylvania DX Association, from left: K3UA, K3MC, AD8J, KB3KV, KF3C, and KJ3Q.

Also on the east coast is the newly-founded Connecticut DX Association. That association's officers are: President Ron Richards WB1EAZ, Vice-President Paul Shafer KB1BE, and Secretary/Treasurer Tom Le Clerc WB1CBY.

And in the center of the country, the dynamic and interesting Kansas City DX Club sports the following for the 1984 slate of officers: President John Chass W0JLC, Vice-President Bill Henderson K0VBU, Treasurer Tom Bishop K0TLM, Secretary Steve Gecewicz K0CS, and (newsletter) Editor Mike Crabtree AB0X.

Congratulations to all these and other DX club officers. And for the rest of you: Isn't it time you did your part to make your DX club interesting and helpful?

Operating Events

No matter what other, nonoperating activities the DXer finds to while away the month of July, nothing provides quite the same satisfaction as getting on the air and working DX. Fortunately, despite the lousy band conditions, a couple of operating events help stir up the DXers in the heat of the summer.

The most popular on-the-air activity in July is the International Amateur Radio Union (IARU) Radiosport competition, the weekend of July 14–15, 1984. (See the "Contests" column in this issue, and see the rules in the May issue of *QST*.) Briefly, you try to work stations in different International Telecommunications Union (ITU) zones, *which are not the same* as the CQ magazine zones for their contest and awards program.

The Radiosport rules (assuming no major changes from previous years—check this) provide a heavy premium for working stations on different continents. In addition to the possible new zone multipliers of these stations, each contact with a station on a different continent counts five times as much as a contact within one's own zone. So the emphasis is on DX contacts.

The rule structure of this contest brings out many DX stations, anxious to fight the low Maximum Usable Frequency and high noise levels to work each other and maybe even you! The eastern Europeans and Russians are especially fond of this contest, and Radiosport provides an excellent opportunity to contact many of these stations.

The 1984 Radiosport contest will be quite different in at least one way: Many of the Russian stations will be sporting new callsigns, thanks to a major revision of the Russian callsign system this spring. All the radio club calls in the Soviet Union and many individual callsigns will be different. And unlike the FCC callsign "reform," in the USSR the callsign will give the location!

Here's how the system will work, with thanks to the *Murphy Message*, the newsletter of the Murphy's Marauders radio club:

The *first* letter of the callsign will be U or R. (Ten-meter fans are familiar with the low-power RA prefix stations from the USSR.) The *second* letter will indicate the republic: A for RSFSR, B for the Ukraine, etc. This is similar to the present system, but the procedure will be used for *all* calls in the republic, including club callsigns, which presently have a UK prefix. The number in the call will no longer be fixed, as now. If you hear UB, you won't be able automatically to add a 5. UB calls will be issued with any numeral, and the same with all the other republics, UI8, UL7, UF6, etc. The *third* letter (directly after the numeral) will help identify the oblast, or location. The *fourth* letter will be anything except W through Z, which are reserved for club stations. There might be a fifth letter in some areas. For example, UB3BDS would be a Ukrainian in the Ternopol oblast. Just to confuse things, some of the older two-letter suffix calls (issued before 1970) will stay the same.

In that part of the world, where amateurs must build their own gear and individual amateur licenses are relatively few and far between, the club stations account for much of the operating activity. In every contest, the big-gun clubs, such as UK2BBB, provide the little-gun DXers with their best shot at working the rarer Soviet republics. All these clubs now operate under new callsigns without the familiar UK prefix. Club stations will be identified by the last two letters of the callsign: WA through ZZ. So a club station in the Ternopol oblast might be UB8BZZ. (In RSFSR, UA1–4, 6, 9, and 0, club calls will have a UZ or RZ prefix.)

Bob Hess KA3EAL does his DXing from this compact station in Penns Creek, Pennsylvania.

Meanwhile, we hear that the French are jumping on the new callsign bandwagon. According to *Les Nouvelles DX*, the present F1 calls will change to FC1 and FD1. F2–F9 calls will emerge as FD2–9 and FE2–9. Corsica Island calls, now sporting an FC prefix, will be TK1–TK4. Other French overseas departments (Martinique, etc.) probably also will change.

All of this callsign switching will be confusing for a time, but it will make the prefix hunters delirious! Dozens of new prefixes will be on the air this summer, most never heard before—another excellent reason to keep up with your DX reading.

Another operating activity in July is the annual French Polynesia Tiurai. Listen for Tahitian stations July 14–21 on the following frequencies: 28600, 21300, 14240, 14180, 7090, and 3800, especially between 0200 and 1000 UTC. The stations will be celebrating their annual festival with a special certificate for working at least three Tahitian stations on at least two different bands. Send your log data and 12 IRCs to Tiurai 1984 Certificate, CORA, BP 5008, Pirae, Tahiti, French Polynesia.

The station that works the greatest number of French Polynesian stations during the festival week will win a handsome trophy: a beautiful engraved mother-of-pearl shell. (Thanks to Russ Forbes WB6GFJ/FO9FB for this news.)

DX Convention

By now, your month of July should be well-filled with DX activities. But if you are still yearning for more, take heart: There's a way to wrap up the DX month in fine fashion. The Northwest DX Convention will be held July 27–29, at the Greenwood Inn in Beaverton, Oregon, just outside of Portland. For more information on the convention, contact Bob Herndon W7XN, Willamette Valley DX Club, Box 555, Portland OR 97207. Who knows, you might even meet the DX editor of *73* magazine there!

So before you decide that the entire month of July is a complete waste, DX-wise, tune up those antennas, work the new Russian prefixes, hang your Tiuria certificate on your wall, and have a few eyeball contacts at the DX convention. And, yes, say hello to the family sometime during the month, so that they don't consider you a *complete* stranger!

LETTERS

OH, HE *NEEDS* HELP!

A number of others are working on wild and imaginative conversions and end up seeking help from those who have already done it. Perhaps someone will be able to provide me assistance as well?

Does anyone have instructions for converting a military surplus ARC-5/T-19 into an allband, all-mode, synthesized transceiver with automatic antenna tuner built-in? If possible, I'd like to replace the 1625 tubes (hard to find) with more common 3-500Zs for full legal power, and transistorize the rest. It should have at least 16K of memory and search/scan capability with priority channel lock-out—at least on all bands above 30 MHz. Oh yes, unless a key jack is included I probably won't be interested. Oh, one thing more: I'd like to be able to use it also as a vacuum cleaner, LNA for satellite TV reception, and wattmeter—at the flip of a 4-position switch.

Anyone who has already done this mod, please send me an SASE; I'll tell you how much you owe for photocopies. Thanks. *73*.

Robert (50-Ohm Bob) Wheaton W5XW
San Antonio TX

HATS OFF AND SALUTES

About 5:00 pm on Monday, April 9, 1984, during a brief trip to California to analyze a budding computer manufacturing company, I was enjoying the California sun in the beautiful backyard of the home of the friends with whom I was staying. Stripped to my shorts, I was stretched out listening to the chatter of happy people on my 2-meter hand-held when I was brought upright hearing, *"Mayday! Mayday! This is KE6HI. Mayday! I need a local contact fast!"*

My first reaction was to answer the distress call, but being pretty unfamiliar with the area, I waited an instant to see if a local would answer. My hunch was right for only a few seconds later I heard, *"KE6HI this is KF6TF. You are loud and clear. State your emergency. This is KF6TF. The handle is Dora. Go ahead."* The message was transmitted in a calm, precise, and authoritative manner.

From my notes taken at the time, here is what apparently happened thereafter. KE6HI, handle Alma, driving on Interstate 5 in heavy traffic during rush hour was following at a fair speed behind a motorcyclist when the cyclist crashed and was thrown onto the pavement and appeared to have a broken leg. The cyclist was at the mercy of the speeding traffic, and KE6HI, instead of swerving to pass the cyclist, chose to slam on her brakes and park in the middle of the freeway in a way to protect the downed cyclist from the certain dangers of oncoming traffic. After positioning her car in a protective position, turning on her flasher warning lights, and assuring herself that the injured cyclist would not be further injured, KE6HI sent out her Mayday call. After passing the pertinent information to KF6TF, KF6TF contacted the authorities and within ten minutes had the police, the fire and rescue team, and an ambulance at the site of the accident. While waiting, KE6HI directed traffic until the police arrived and took over.

Two fine California ladies doing a splendid job, excellently executed in a professional way: Alma Bourhenne KE6HI from Cardiff by the Sea, and Neldora Tuttle KF6TF from Escondido. I was most impressed with how well they did a volunteer job. I think they probably saved the life of the cyclist. Wouldn't it be nice for some of you to send each of them a QSL card just saying, "Well Done!"

Yes, a commendable job done by two fine ladies who know how to handle themselves with courage, efficiency, and dispatch under extreme emergency conditions. I was so proud of their performance that I hardly could wait to get home here in Washington State so I could tell my lovely wife all about it. My wife? Yes, she just got her Novice call, KA7RXM, and I'm mighty proud of her, too!

Christian L. Engleman W7QQ
Washougal WA

DX WORLD

Recently a program I wrote appeared in *73* (February, 1984), "Put the DX World On the Screen." I would like to thank all the many people who wrote me with their comments, suggestions, and their orders. The real pay in doing a project like this is the thanks that I receive from all my fellow hams; lord knows the money isn't worth it. I hope that all the people who received my program were pleased with what they received.

As many people already know, I did a rewrite of the Prefix Locator program for the Commodore 64. I added many features to it that you will not find in the VIC version. Let me list some of the added features.

- A more expanded data list, including cities and all the states in the US of A.
- Two clocks, one local and one GMT.
- User-selectable screen, border, and print colors.
- An MUF forecast in local time and GMT time.
- Printer output routines.
- A machine-language data-search routine. Now data searches take three to five seconds instead of three to four minutes.
- And, recently added, is a sunrise and sunset calculation routine.

This version is available from me or from RAK Electronics. The C64 version is available on tape or disk. A C64 version of one form or another has been available since November, 1983. The C64 version has been updated several times and some older versions don't have all the features mentioned above.

Eugene Morgan WB7RLX
1311 Cross St.
Ogden UT 84404

COME TO THE FAIR

A working amateur-radio station with space-age equipment, an international message-sending service, and the Smithsonian Institution's Marconi exhibit, will demonstrate amateur radio's role in worldwide friendship.

The Louisiana Amateur Radio Exhibition's booth at the Julia Street exit will outline amateur radio's heritage from the experimental days of radio wizard Guglielmo Marconi to disaster communications such as during Gulf Coast hurricanes, the current era of amateur-radio space communications including astronaut Owen Garriott's amateur-radio experiments from the space shuttle *Columbia* last year, and speculation on the hobby's future.

Operators will demonstrate how ama-

teurs communicate today, including the newer modes of color slow-scan television, radio-teleprinter, and computer and space satellite methods, and the standby, Morse code.

Visitors from the world's fair countries of the United States, Canada, Australia, Israel, Liberia, and Peru may send free messages to friends in their countries from the booth, via the hobby's international message system.

Among Marconi's relics on display through mid-August will be a rotary spark-gap transmitter used by early amateurs and a magnetic detector used by radio stations in 1912.

Visiting amateur-radio operators will be allowed to use the station on presentation of their licenses. They will identify themselves with the station's callsign, K5WF, which belongs to Howard T. DeLaneuville of Jefferson, Louisiana.

A unique verification card will be provided to amateur-radio operators who contact the stations and to shortwave listeners who describe hearing it. The QSL is being designed by John Chase, New Orleans historical cartoonist.

The Historic New Orleans Collection is providing a full-time curator, Patricia Tusa (XYL of Nick Tusa K5EF), to watch after the Marconi exhibit, which is being provided through the Smithsonian Institution Traveling Exhibition Service.

Marconi's daughter, Goia Marconi Bragga, has indicated that she would like to visit the exhibit. Plans are being made to have her come in June.

Amateur-radio equipment manufacturers are lending American-made products for use at the booth. Local volunteers have been constructing and designing the exhibit. Many volunteers will be needed to man the booth for the six-month show.

John J. Uhl KV5E, President
Louisiana Amateur Radio Exhibition, Inc.
New Orleans LA 70124

AWARDS

USS COD DXING

NOARS and the *USS Cod* will be on the air again this summer. Northern Ohio ARS members will be operating from the *Cod* starting Memorial Day weekend running daily through Labor Day weekend. Look for operations in the lower portion of the General bands 10 through 80 meters, with special Novice operations on June 16, July 15, and August 18, and Extra operations during the Cleveland Hamfest, September 23rd.

QSL cards picturing the *Cod* and NOARS station will be sent out confirming all contacts, a special 8×11 certificate will be available upon request with QSL confirming the two-way contact and $1.00 for handling and postage. Send all QSLs to WD8RZG.

The *USS Cod* is on permanent display as a war memorial to honor the men of the Silent Service and is located at the port of Cleveland between East 9th Street pier and Burke Lakefront Airport. Guided tours given daily. So come on down for an historic visit into the past for an adventure to remember.

BARC CERTIFICATE

A handsome new amateur operating certificate is now being offered by the Bartlesville (Oklahoma) Amateur Radio Club. The purpose of the certificate is to focus attention on the interesting "Green Country" region of northeast Oklahoma, and to emphasize the varied operating activities of the nearly 200 amateurs within that area.

The Green Country award is available to anyone making two-way amateur-radio contact with three hams in the Nowata, Osage, and/or Washington Counties of Oklahoma. All bands and modes are permitted. The certificates will be numbered and issued serially.

Applicants for the award should submit calls and pertinent details of their three qualifying QSOs, plus a $1.00 handling fee. QSLs are not required. Applications should be mailed to W5NS Awards Manager, 1800 Moonlight Drive, Bartlesville OK 74006.

2000TH ANNIVERSARY

To celebrate both the 2000th anniversary of the founding of Trier, Germany, and the 60th anniversary of the New Trier High School ARC, a certificate will be awarded to any amateur contacting a station in *both* Trier and New Trier Township, Illinois (includes the villages of Wilmette, Winnetka, Kenilworth, Glencoe, and Northfield). Contacts must be made in 1984, any band, any mode.

Send QSLs for both QSOs to New Trier H.S. ARC, W9EDC, New Trier H.S., Winnetka IL 60093, along with a large SASE, 54 cents US postage, or 4 IRCs for a non-folded certificate.

To assist amateurs in earning the award, special-event stations will be operated simultaneously from Trier (DL0TR, DL0BBS) and New Trier (W9EDC) on June 30th and July 1st. Operation will be 80–10 meters (SSB and some CW), 15 kHz above General band edges. DL0TR and DL0BBS will also go RTTY and OSCAR 10.

THUNDER ON THE OHIO

The Tri-State Amateur Radio Society (TARS) will operate a special-event station in conjunction with the Freedom Festival and Thunder on The Ohio Hydroplane Races during the Fourth of July weekend.

The station will use the club call W9OG (W 9 Old Glory) which is very appropriate for July 4th. Operations will begin on June 30, 1984, and continue daily through July 4, 1984. Hours of operation will be 10:00 am to 5:00 pm CDT in the lower portions of the Novice and General segments of the 10-, 15-, 20-, 40-, and 80-meter bands. All modes will be used including RTTY.

An attractive 8×10 certificate will be available for $1.00 postage to confirm contacts with the station. Certificates will be packaged flat and be suitable for framing. For those who do not wish a certificate, a special QSL card will be sent confirming all contacts. Please include 20¢ postage for the QSL card.

Send QSO information to TARS Special-Event Station W9OG, Attn: M. G. Anderson, PO Box 3284, Evansville IN 47732. For additional information on the special-event station contact me by phone: (812)-424-2306 (days) or (812)-476-5572 (evenings), or write asking to be placed on our publicity mailing list.

STEAM ENGINE CONVENTION

A special-event station will be operating July 13–15 from the Bourbon County Fairgrounds in Bourbon County, Kentucky, to commemorate the annual steam engine convention. This station will be operating with the call of WD4GPO, in the General phone and CW portion, with some Novice activity planned. All amateurs and SWLs working this station during this time can receive a commemorative QSL card from the Pioneer Amateur Radio Club of Winchester, Kentucky; send an SASE to Pete Clough WD4GPO, 425 Bell Street, Paris KY 40361.

SPEEDWAY STATION

The Adrian Amateur Radio Club is having a special-event station, W8TQE, at the Michigan International Speedway (MIS) on July 20, 21, and 22. The frequencies will be 28.625, 21.360, 14240, 7240, 3900 ± QRM. The Novice bands up 10 kHz, 21.110, 7.110, 3.710. This is to celebrate the Michigan 500 Indy-type car race. A special certificate will be offered. Send a large SASE to Adrian Amateur Radio Club, PO Box 26, Adrian MI 49221.

DETROIT ARSENAL

The Tank-Automotive Command ARC will operate W8JPW on July 21, 1984, from 1300–2000Z to commemorate the 43rd year of the Detroit Arsenal, home of the the US Army Tank-Automotive Command. Frequencies: phone 7.274, 21.400, and 146.49 MHz; and CW 7.055 from 1500–1700Z. Put your QSO number and frequency in upper-left corner of outer envelope. Send 9"×12" SASE for unfolded certificate; otherwise, SASE to: W8JPW, US Army Communications Command, Attn: CCNC-TAC-M, 28251 Van Dyke, Warren MI 48090.

BERNE SWISS DAYS

The Adams County ARC will operate KC9TZ from 1400Z July 27 to 2200Z July 28 to commemorate Berne Swiss Days. Operation will be 15 kHz above the bottom of the General phone band on 20m and 40m, and the Novice band on 15m and 40m. QSL to the *Callbook* address for a decorative certificate.

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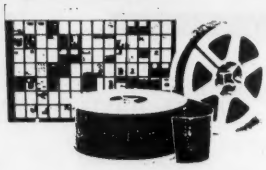

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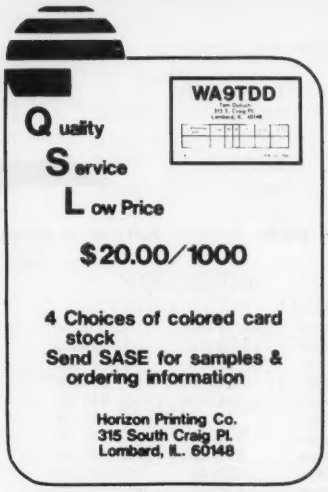

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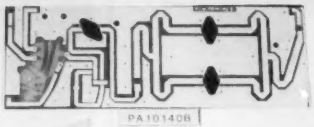

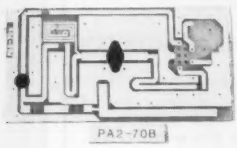

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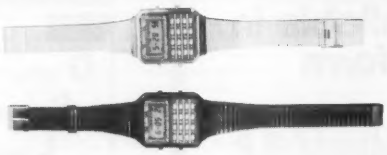

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LO and RF 0.2 to 300MHz	IF DC to 300MHz	$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz 8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above 8.5dB Max. 50 to 300MHz	
Conversion Compression	.3dB Typ.	

NEC (NIPPON ELECTRIC CO. LTD. NE57835/2SC2150 Microwave Transistor

NF Min F=2GHz dB 2.4 Typ. MAG F=2GHz dB 12 Typ. $5.30
F=3GHz dB 3.4 Typ. F=3GHz dB 9 Typ.
F=4GHz dB 4.3 Typ. F=4GHz dB 6.5 Typ.

Ft Gain Bandwidth Product at Vce=8v, Ic=10ma. GHz 4 Min. 6 Typ.
Vcbo 25v Vceo 11v Vebo 3v Ic 50ma. Pt. 250mw

UNELCO RF Power and Linear Amplifier Capacitors

These are the famous capacitors used by all the RF Power and Linear Amplifier manufacturers, and described in the RF Data Book.

5pf	10pf	18pf	30pf	43pf	100pf	200pf	1 to 10pcs. $1.00 ea
5.1pf	12pf	22pf	32pf	51pf	110pf	220pf	11 to 50pcs. $ .90 ea
6.8pf	13pf	25pf	33pf	60pf	120pf	470pf	51 up pcs. $ .80 ea
7pf	14pf	27pf	34pf	80pf	130pf	500pf	
8.2pf	15pf	27.5pf	40pf	82pf	140pf	1000pf	

NIPPON ELECTRIC COMPANY TUNNEL DIODES $7.50

		MODEL 1S2199	1S2200
Peak Pt. Current ma.	Ip	9min. 10Typ. 11max.	9min. 10Typ. 11max.
Valley Pt. Current ma.	Iv	1.2Typ. 1.5max.	1.2Typ. 1.5max.
Peak Pt. Voltage mv.	Vp	95Typ. 120max.	75Typ. 90max.
Projected Peak Pt. Voltage mv.	Vpp Vf=Ip	480min. 550Typ. 630max.	440min. 520Typ. 600max.
Series Res. Ohms	rS	2.5Typ. 4max.	2Typ. 3max.
Terminal Cap. pf.	Ct	1.7Typ. 2max.	5Typ. 8max.
Valley Pt. Voltage mv.	VV	370Typ.	350Typ.

FAIRCHILD / DUMONT Oscilloscope Probes Model 4290B

Input Impedance 10 meg., Input Capacity 6.5 to 12pf., Division Ratio (Volts/Div Factor) 10:1, Cable Length 4Ft. , Frequency Range Over 100MHz.
These Probes will work on all Tektronix, Hewlett Packard, and other Oscilloscopes.

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2N1562	25.00
2N1692	25.00
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2N2857JANTX	4.10
2N2857JANTXV	4.10
2N2876	13.50
2N2947	18.35
2N2948	13.00
2N2949	15.50
2N3375	17.10
2N3553	1.55
2N3632	15.50
2N3733	11.00
2N3818	5.00
2N3866	1.30
2N3866JAN	2.20
2N3924	3.35
2N3927	17.25
2N3950	25.00
2N4012	11.00
2N4041	14.00
2N4072	1.80
2N4080	4.53
2N4127	21.00
2N4427	1.30
2N4428	1.85
2N4430	11.80
2N4957	3.45
2N4959	2.30
2N5090	13.80
2N5108	3.45
2N5109	1.70
2N5160	3.45
2N5177	21.62
2N5179	1.04
2N5216	56.00
2N5583	3.45
2N5589	9.77
2N5590	10.92
2N5591	13.80
2N5637	15.50
2N5641	12.42
2N5642	14.03
2N5643	15.50
2N5645	13.80
2N5646	20.70
2N5651	11.05
2N5691	18.00
2N5764	27.00
2N5836	3.45
2N5842/MM1607	8.45
2N5849	20.00
2N5913	3.25
2N5916	36.00
2N5922	10.00
2N5923	25.00
2N5941	23.00
2N5942	40.00
2N5944	10.35
2N5945	11.50
2N5946	14.40
2N6080	10.35
2N6081	12.07
2N6082	12.65
2N6083	13.25
2N6084	15.00
2N6094	11.00
2N6095	12.00
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2N6097	20.70
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2SC756A	7.50
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2SC1018	1.00
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2SC1070	2.50
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2SC1760	1.50
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BFR99	2.50
BFT12	2.50
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BFW17	2.50
BFW92	1.50
BFX44	2.50
BFX48	2.50
BFX65	2.50
BFX84	2.50
BFX85	2.50
BFX86	2.50
BFX89	1.00
BFY11	2.50
BFY18	2.50
BFY19	2.50
BFY39	2.50
BFY90	1.00
BLX67	15.24
BLX68C3	15.24
BLX93C3	22.21
BLY87A	8.94
BLY88C3	13.08
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M9630	18.00
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M9755	19.50
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M9850	16.90
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M9887	5.25
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MRF208	16.10
MRF212	16.10
MRF223	13.25
MRF224	15.50
MRF231	10.92
MRF232	12.07
MRF233	12.65
MRF237	3.15
MRF238	13.80
MRF239	17.25
MRF245	35.65
MRF247	35.65
MRF304	43.45
MRF309	33.81
MRF314	28.52
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MRF421	36.80
MRF422A	41.40
MRF427	17.25
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MRF433	12.07
MRF449/A	12.65
MRF450/A	14.37
MRF453/A	18.40
MRF454/A	20.12
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MRF511	10.69
MRF515	2.00
MRF517	2.00
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MSC1720-12	225.00
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NE13783	POR
NE21889	POR
NE57835	5.70
NE73436	2.50
TRW	
PRT8637	POR
PT3190	POR
PT3194	POR
PT3195	POR
PT3537	7.80
PT4166E	POR
PT4176D	POR
PT4186B	POR
PT4209	POR
PT4209C/5645	POR
PT4556	24.60
PT4570	7.50
PT4577	POR
PT4590	POR
PT4612	POR
PT4628	POR
PT4640	POR
PT4642	POR
PT5632	4.70
PT5749	POR
PT6629	POR
PT6709	POR
PT6720	POR
PT8510	POR
PT8524	POR
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40081	5.00
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SD1009	15.00	SD1133	14.00	SD1289-1	15.00	SD1480	60.00
SD1009-2	15.00	SD1133-1	14.00	SD1290-4	15.00	SD1484	1.50
SD1012	9.90	SD1134-1	3.00	SD1290-7	15.00	SD1484-5	1.50
SD1012-3	9.90	SD1135	8.00	SD1300	3.00	SD1484-6	1.50
SD1012-5	9.90	SD1136	15.00	SD1301-7	3.00	SD1484-7	1.50
SD1013-3	13.50	SD1136-2	15.00	SD1305	3.00	SD1488	39.00
SD1013-7	13.50	SD1143-1	12.00	SD1307	3.00	SD1488-1	28.00
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SD1115-3	8.00	SD1272-2	15.00	SD1451	18.00	TA7995/2N6267	150.00
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SD1116	5.00	SD1278	20.00	SD1452	20.00	MRF479	8.05
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1N2930	15.00	1N2932	15.00	1N3540	15.00	1N3712	11.00
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1N3717	14.00	1N3718	10.00	1N3721	14.00	1N3733	10.00
1N3747	21.00	1N4386	20.00	1N4396	15.00	1N4785	11.00
1N4812B	9.00	1N5139A/B	4.25	1N5140A/B	4.25	1N5141A/B	4.25
1N5142A/B	4.25	1N5143A/B	4.25	1N5144A/B	4.25	1N5145A/B	4.25
1N5146A/B	4.25	1N5147A/B	4.25	1N5148A/B	4.25	1N5167	5.50
1N5453	3.75	1N5465	7.65	1N5711	1.00	1N5711 JAN	2.00
1N5713	5.00	1N5767	2.00	1N6263	1.00	1S2199	15.00
1S2200	15.00	1S2208/9	1.00	8B1087/48R869558	65.00	8D3020	65.00
A2X116M Aertech	50.00	BB105B	1.00	BB105G	1.00	BD4/4JFBD4 G.E.	15.00
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D4233B Alpha	POR	D4900 Alpha	POR	D4959 Alpha	POR	D4987M Alpha	POR
D5047C Alpha	POR	D5147D Alpa	POR	D5503 Alpha	POR	D5506 Alpha	POR
DGB6158-98 Alpha	POR	DMD6022 Alpha	POR	DMD6460A Alpha	POR	DP20054 Crown	POR
GC1691-89 GHZ	31.35	GC1602-89 GHZ	31.35	GC1607-40 GHZ	31.35	GC2531-88 GHZ	37.40
GC2542-46 GHZ	37.40	GC3208-40 GHZ	37.40	GC17044 GHZ	50.00	HP33644A-H01	125.00
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HP5082-1028	POR	HP5082-1332	POR	HP5082-2254	POR	HP5082-2302	10.70
HP5082-2303	5.20	HP5082-2696	POR	HP5082-2711	23.15	HP5082-2727	POR
HP5082-2800	1.00	HP5082-2805	4.45	HP5082-2835	1.00	HP5082-2884	POR
HP5082-3039	6.70	HP5082-3040	36.00	HP5082-3080	2.00	HP5082-3188	1.00
HP5082-3379	1.50	HP5082-6459	POR	HP5082-6462	POR	HP5082-6888	POR
HP5082-8016	POR	HP5082-8323	POR	K3A Kemtron	7.00	MA450A	POR
MA475	POR	MA40008	POR	MA41487	POR	MA41765	POR
MA41766	POR	MA43004	48.00	MA43589	POR	MA43622	POR
MA43636	POR	MA45104	27.00	MA47044	POR	MA47051	25.50
MA47100	3.05	MA47202	30.80	MA47771	POR	MA47838*	POR
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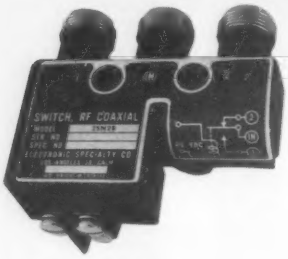
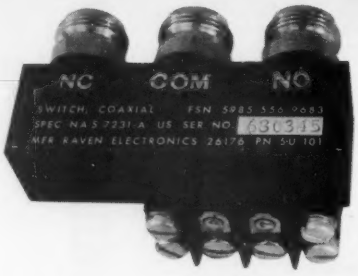
COAXIAL RELAY SWITCHES SPDT

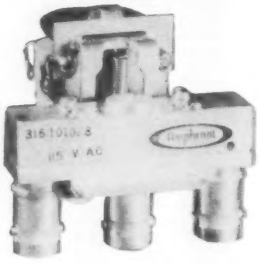
Electronic Specialty Co./Raven Electronics FSN 5985-556-9683 $49.00
Part # 25N28 Part # SU-01
26Vdc Type N Connector, DC to 1 GHz.





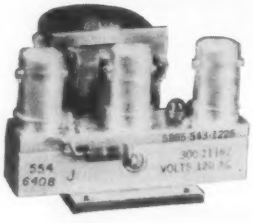
Amphenol
Part # 316-10102-8
115Vac Type BNC DC to 3 GHz.

$29.99



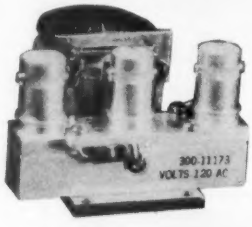
FXR
Part # 300-11182
120Vac Type BNC DC to 4 GHz.
FSN 5985-543-1225

$39.99



FXR
Part # 300-11173
120Vac Type BNC Same
FSN 5985-543-1850

$39.99



BNC To Banana Plug Coax Cable RG-58 36 inch or BNC to N Coax Cable RG-58 36 inch.

$7.99 or 2 For $13.99 or 10 For $50.00

$8.99 or 2 For $15.99 or 10 For $60.00

SOLID STATE RELAYS

P&B Model ECT1DB72 PRICE EACH $5.00	5vdc turn on	120vac contact at 7amps or 20amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Digisig, Inc. Model ECS-215 PRICE EACH $7.50	5vdc turn on	240vac contact 14amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Grigsby/Barton Model GB7400 PRICE EACH $7.50	5vdc turn on	240vac contact at 15amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.

NOTE: *** Items may be substituted with other brands or equivalent model numbers. ***

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RECALL PHONE MEMORY TELEPHONE WITH 24 NUMBER AUTO DIALER

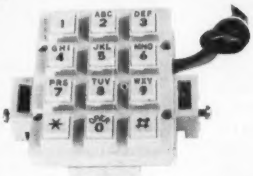
The Recall Phone Telephone employs the latest state of art communications technology.It is a combination telephone and automatic dialer that uses premium-quality,solid-state circuitry to assure high-reliability performance in personal or business applications. $49.99

ARON ALPHA RAPID BONDING GLUE

Super Glue #CE-486 high strength rapid bonding adhesive.Alpha Cyanoacrylate.Set-Time 20 to 40 sec.,0.7fl.oz.(20gm.)
$2.00

TOUCH TONE PAD

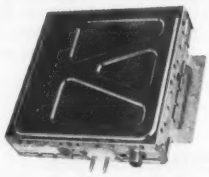
This pad contains all the electronics to produce standard touch-tone tones. New with data.



$9.99 or 10/$89.99

MITSUMI UHF/VHF VARACTOR TUNER MODEL UVE1A

Perfect for those unscrambler projects. New with data.



$19.99 or 10/$149.99

INTEGRATED CIRCUIT.		1 to 10	11up
MC1372P	Color TV Video Modulator Circuit.	$ 4.42	$2.95
MC1358P	IF Amp.,Limiter,FM Detector,Audio Driver,Electronic Attenuator.	5.00	4.00
MC1350P	IF Amplifier	1.50	1.25
MC1330A1P	Low Level Video Detector	1.50	1.15
MC1310P	FM Stereo Demodulator	4.29	3.30
MC1496P	Balanced Modulator/Demodulator	1.50	1.25
LM565N	Phase Locked Loop	2.50	2.00
LM380N14	2Watt Audio Power Amplifier	1.56	1.25
LM1889N	TV Video Modulator	5.00	4.00
NE564N	Phase Locked Loop	10.00	8.00
NE561N	Phase Locked Loop	10.00	8.00

FERRANTI ELECTRONICS AM RADIO RECEIVER MODEL ZN414 INTEGRATED CIRCUIT.
Features:
1.2 to 1.6 volt operating range.,Less than 0.5ma current consumption. 150KHz to 3MHz Frequency range.,Easy to assemble,no alignment necessary. Effective and variable AGC action., Will drive an earphone direct. Excellent audio quality.,Typical power gain of 72dB.,TO-18 package. With data. $2.99 or 10 For $24.99

NI CAD RECHARGEABLE BATTERIES

AA Battery Pack of 6 These are Factory New. $5.00

SUB C Pack of 10 2.5Amp/Hr. $10.00

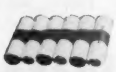
Gates Rechargeable Battery Packs

12vdc at 2.5Amp/Hr. $11.99
12vdc at 5Amp/Hr. $15.99

MOTOROLA MRF559 RF TRANSISTOR

hfe 30min 90typ 200max.
ft 3000mhz
gain 8db min 9.5typ at 870mhz
13db typ at 512mhz
output power .5watts at 12.5vdc at 870mhz.

$2.05 or 10/$15.00



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"SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

SK110	Socket	$POR
SK300A	Socket For 4CX5000A,R,J, 4CX10,000D, 4CX15,000A,J	$520.00
SK400	Socket For 4-125A,250A,400A,400C,4PR125A,400A,4-500A,5-500A	260.00
SK406	Chimney For 4-250A,400A,400C,4PR400A	74.00
SK416	Chimney For 3-400Z	36.00
SK500	Socket For 4-1000A/4PR1000A/B	390.00
SK600	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	51.00
SK602	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	73.00
SK606	Chimney For 4CX250B,BC,FG,R,4CX350A,F,FJ	11.00
SK607	Socket For 4CX600J,JA	60.00
SK610	Socket For 4CX600J,JA	60.00
SK620	Socket For 4CX600J,JA	66.00
SK626	Chimney For 4CX600J,JA	10.00
SK630	Socket For 4CX600J,JA	66.00
SK636B	Chimney For 4CX600J,JA	34.00
SK640	Socket For 4CX600J,JA	36.00
SK646	Chimney For 4CX600J,JA	71.00
SK700	Socket For 4CX300A,Y,4CX125C,F	225.00
SK711A	Socket For 4CX300A,Y,4CX125C,F	225.00
SK740	Socket For 4CX300A,Y,4CX125C,F	86.00
SK770	Socket For 4CX300A,Y,4CX125C,F	86.00
SK800A	Socket For 4CX1000A,4CX1500B	225.00
SK806	Chimney For 4CX1000A,4CX1500B	40.00
SK810	Socket For 4CX1000A,4CX1500B	225.00
SK900	Socket For 4X500A	300.00
SK906	Chimney For 4X500A	57.00
SK1420	Socket For 5CX3000A	650.00
SK1490	Socket For 4CV8000A	585.00

JOHNSON TUBE SOCKETS AND CHIMNEYS

124-111/SK606	Chimney For 4CX250B,BC,FG,R, 4CX350A,F,FJ	$ 10.00
122-0275-001	Socket For 3-500Z, 4-125A, 250A, 400A, 4-500A, 5-500A	(pair)15.00
124-0113-00	Capacitor Ring	15.00
124-116/SK630A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
124-115-2/SK620A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
	813 Tube Socket	20.00

TUBE CAPS (Plate)

HR1, 4	$11.00
HR2,3, 6 & 7	13.00
HR5, 8	14.00
HR9	17.00
HR10	20.00

CHIP CAPACITORS

.8pf	10pf	100pf*	430pf
1pf	12pf	110pf	470pf
1.1pf	15pf	120pf	510pf
1.4pf	18pf	130pf	560pf
1.5pf	20pf	150pf	620pf
1.8pf	22pf	160pf	680pf
2.2pf	24pf	180pf	820pf
2.7pf	27pf	200pf	1000pf/.001uf*
3.3pf	33pf	220pf*	1800pf/.0018uf
3.6pf	39pf	240pf	2700pf/.0027uf
3.9pf	47pf	270pf	10,000pf/.01uf
4.7pf	51pf	300pf	12,000pf/.012uf
5.6pf	56pf	330pf	15,000pf/.015uf
6.8pf	68pf	360pf	18,000pf/.018uf
8.2pf	82pf	390pf	

PRICES: 1 to 10 - .99¢ 101 to 1000 .60¢ * IS A SPECIAL PRICE: 10 for $7.50
11 to 50 - .90¢ 1001 & UP .35¢ 100 for $65.00
51 to 100 - .80¢ 1000 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_0), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

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TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2C39/7289	$ 34.00	1182/4600A	$500.00	ML7815AL	$ 60.00
2E26	7.95	4600A	500.00	7843	107.00
2K28	200.00	4624	310.00	7854	130.00
3-500Z	102.00	4657	84.00	ML7855KAL	125.00
3-1000Z/8164	400.00	4662	100.00	7984	14.95
3B28/866A	9.50	4665	500.00	8072	84.00
3CX400U7/8961	255.00	4687	P.O.R.	8106	5.00
3CX1000A7/8283	526.00	5675	42.00	8117A	225.00
3CX3000F1/8239	567.00	5721	250.00	8121	110.00
3CW30000H7	1700.00	5768	125.00	8122	110.00
3X2500A3	473.00	5819	119.00	8134	470.00
3X3000F1	567.00	5836	232.50	8156	12.00
4-65A/8165	69.00	5837	232.50	8233	60.00
4-125A/4D21	79.00	5861	140.00	8236	35.00
4-250A/5D22	98.00	5867A	185.00	8295/PL172	500.00
4-400A/8438	98.00	5868/AX9902	270.00	8458	35.00
4-400B/7527	110.00	5876/A	42.00	8462	130.00
4-400C/6775	110.00	5881/6L6	8.00	8505A	95.00
4-1000A/8166	444.00	5893	60.00	8533W	136.00
4CX250B/7203	54.00	5894/A	54.00	8560/A	75.00
4CX250FG/8621	75.00	5894B/8737	54.00	8560AS	100.00
4CX250K/8245	125.00	5946	395.00	8608	38.00
4CX250R/7580W	90.00	6083/AZ9909	95.00	8624	100.00
4CX300A/8167	170.00	6146/6146A	8.50	8637	70.00
4CX350A/8321	110.00	6146B/8298	10.50	8643	83.00
4CX350F/8322	115.00	6146W/7212	17.95	8647	168.00
4CX350FJ/8904	140.00	6156	110.00	8683	95.00
4CX600J/8809	835.00	6159	13.85	8877	465.00
4CX1000A/8168	242.50*	6159B	23.50	8908	13.00
4CX1000A/8168	485.00	6161	325.00	8950	13.00
4CX1500B/8660	555.00	6280	42.50	8930	137.00
4CX5000A/8170	1100.00	6291	180.00	6L6 Metal	25.00
4CX10000D/8171	1255.00	6293	24.00	6L6GC	5.03
4CX15000A/8281	1500.00	6326	P.O.R.	6CA7/EL34	5.38
4CW800F	710.00	6360/A	5.75	6CL6	3.50
4D32	240.00	6399	540.00	6DJ8	2.50
4E27A/5-125B	240.00	6550A	10.00	6DQ5	6.58
4PR60A	200.00	6883B/8032A/8552	10.00	6GF5	5.85
4PR60B	345.00	6897	160.00	6GJ5A	6.20
4PR65A/8187	175.00	6907	79.00	6GK6	6.00
4PR1000A/8189	590.00	6922/6DJ8	5.00	6HB5	6.00
4X150A/7034	60.00	6939	22.00	6HF5	8.73
4X150D/7609	95.00	7094	250.00	6JG6A	6.28
4X250B	45.00	7117	38.50	6JM6	6.00
4X250F	45.00	7203	P.O.R.	6JN6	6.00
4X500A	412.00	7211	100.00	6JS6C	7.25
5CX1500A	660.00	7213	300.00*	6KN6	5.05
KT88	27.50	7214	300.00*	6KD6	8.25
416B	45.00	7271	135.00	6LF6	7.00
416C	62.50	7289/2C39	34.00	6LQ6 G.E.	7.00
572B/T160L	49.95	7325	P.O.R.	6LQ6/6MJ6 Sylvania	9.00
592/3-200A3	211.00	7360	13.50	6ME6	8.90
807	8.50	7377	85.00	12AT7	3.50
811A	15.00	7408	2.50	12AX7	3.00
812A	29.00	7609	95.00	12BY7	5.00
813	50.00	7735	36.00	12JB6A	6.50

NOTE * = USED TUBE

NOTE P.O.R. = PRICE ON REQUEST

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"FILTERS"

COLLINS Mechanical Filter #526-9724-010 MODEL F455Z32F

455KHZ at 3.2KHz wide. May be other models but equivalent. May be used or new. $15.99

ATLAS Crystal Filters

5.595-2.7/8/LSB, 5.595-2.7/LSB
8 pole 2.7KHz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-2.7/8/U, 5.595-2.7/USB
8 pole 2.7Khz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-.500/4, 5.595-.500/4/CW
4 pole 500 cycles wide CW. Impedance 800ohms 15pf In/800ohms 0pf out. 19.99

9.0USB/CW
6 pole 2.7KHz wide at 6dB. Impedance 680ohms 7pf In/300ohms 8pf out. CW-1599Hz 19.99

KOKUSAI ELECTRIC CO, Mechanical Filter #MF-455-ZL/ZU-21H

455KHz at Center Frequency of 453.5KC. Carrier Frequency of 455KHz 2.36KC Bandwidth.
Upper sideband. (ZU) 19.99
Lower sideband. (ZL) 19.99

****

CRYSTAL FILTERS

NIKKO	FX-07800C	7.8MHz	$10.00
TEW	FEC-103-2	10.6935MHz	10.00
SDK	SCH-113A	11.2735MHz	10.00
TAMA	TF-31H250	CF 3179.3KHz	19.99
TYCO/CD	001019880	10.7MHz 2pole 15KHz bandwidth	5.00
MOTOROLA	4884863B01	11.7MHz 2pole 15KHz bandwidth	5.00
PTI	5350C	12MHz 2pole 15KHz bandwidth	5.00
PTI	5426C	21.4MHz 2pole 15KHz bandwidth	5.00
PTI	1479	10.7MHz 8pole bandwidth 7.5KHz at 3dB, 5KHz at 6dB	20.00
COMTECH	A10300	45MHz 2pole 15KHz bandwidth	6.00
FRC	ERXF-15700	20.6MHz 36KHz wide	10.00
FILTECH	2131	CF 7.825MHz	10.00

****

CERAMIC FILTERS

AXEL	4F449	12.6KC Bandpass Filter 3dB bandwidth 1.6KHz from 11.8-13.4KHz	10.00
CLEVITE	TO-01A	455KHz+-2KHz bandwidth 4-7% at 3dB	5.00
	TCF4-12D36A	455KHz+-1KHz bandwidth 6dB min 12KHz, 60dB max 36KHz	10.00
MURATA	BFB455B	455KHz	2.50
	BFB455L	455KHz	3.50
	CFM455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 50dB	6.65
	CFM455D	455KHz +-7KHz at 3dB , +-10KHz at 6dB , +-20KHz at 50dB	6.65
	CFR455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 60dB	8.00
	CFU455B	455KHz +-2KHz bandwidth +-15KHz at 6dB, +-30KHz at 40dB	2.90
	CFU455C	455KHz +-2KHz bandwidth +-12.5KHz at 6dB , +-24KHz at 40dB	2.90
	CFU455G	455KHz +-1KHz bandwidth +-4.5KHz at 6dB , +-10KHz at 40dB	2.90
	CFU455H	455KHz +-1KHz bandwidth +-3KHz at 6dB , +-9KHz at 40dB	2.90
	CFU455I	455KHz +-1KHz bandwidth +-2KHz at 6dB , +-6KHz at 40dB	2.90
	CFW455D	455KHz +-10KHz at 6dB , +-20KHz at 40dB	2.90
	CFW455H	455KHz +-3KHz at 6dB , +-9KHz at 40dB	2.90
	SFB455D	455KHz	2.50
	SFD455D	455KHz +-2KHz , 3dB bandwidth 4.5KHz +-1KHz	5.00
	SFE10.7MA	10.7MHz 280KHz +-50KHz at 3dB , 650KHz at 20dB	2.50
	SFE10.7MS	10,7MHz 230KHz +-50KHz at 3dB , 570KHz at 20dB	2.50
	SFG10.7MA	10.7MHz	10.00
NIPPON	LF-B4/CFU455I	455KHz +-1KHz	2.90
	LF-B6/CFU455H	455KHz +-1KHz	2.90
	LF-B8	455KHz	2.90
	LF-C18	455KHz	10.00
TOKIN	CF455A/BFU455K	455KHz +-2KHz	5.00
MATSUSHIRA	EFC-L455K	455KHz	7.00

****

SPECTRA PHYSICS INC. Model 088 HeNe LASER TUBES

POWER OUTPUT 1.6MW. BEAM DIA. .75MM BEAM DIR. 2.7MR 8KV STARTING VOLTAGE DC
68K OHM 1WATT BALLAST 1000VDC +-100VDC At 3.7MA $59.99

ROTRON MUFFIN FANS Model MARK4/MU2A1

115 VAC 14WATTS 50/60CPS IMPEDENCE PROTECTED-F 88CFM at 50CPS $ 7.99
105CFM at 60CPS

THESE ARE NEW

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HEWLETT PACKARD SIGNAL GENERATORS

606A	50KHz to 65MHz in 6 bands +-1%,Output level adjustable 0.1uV to 3V into 50 ohms.Built-in crystal calibrator.400 -1000Hz modulation.	$ 650.00
606B	Same as above but has frequency control feature to allow operation with HP 8708A Synchronizer.	$1100.00
608C	10MHz to 480MHz,0-1uV-1V into 50 ohms,AM,CW,or pulse modulation, calibrated attenuator.	$ 500.00
608D/ TS510	10MHz to 420MHz, 0.1uV-0.5V into 50 ohms,+-0.5% accuracy, built-in crystal calibrator, AM-CW or pulse output.	$ 375.00
608E	Improved version of popular 608C.Up to 1V output.Improved stability,low residual FM.	$1450.00
608F	10MHz to 455MHz in 5 bands +-1% frequency accuracy with built-in crystal calibrator.Can be used with HP 8708A Synchronizer. Output continuously adjustable from .1uV to .5V into 50 ohms.	$1100.00
612A	450-1230MHz ,0.1uV-0.5V into 50 ohms,calibrated output.	$ 750.00
614A	900-2100MHz with many features including calibrated output and all modulation characteristics.	$ 500.00
616A/ TS403	Direct reading and direct control from 1.8 to 4.2GHz. The H.P.616A features +-1.5dB calibrated output accuracy from -3127dBm to -dBm.The output is directly calibrated in microvolts and dBm with continuous monitoring. Simple operation frequency diad accuracy is +-1% and stability exceeds 0.005%-/ C change in ambient temperature. Calibrated attenuator is within +-1.5dB over entire output band. 50 ohm impedance unit has internal pulse modulation with rep rate variable from 40 Hz to 4KHz,variable pulsewidth(1 to 10usec)and variable pulse delay(3 to 300usec).External modulating inputs increas versatility.	$ 375.00
616B	Same as above but later model.	$ 600.00
618B	3.8 to 7.6GHz range,with calibrated output and selection of pulse-FM or square wave modulation.	$ 600.00
618C	Same as above but later model.	$2200.00
620A	7 to 11GHz range,with calibrated output and selection of pulse-FM or square wave modulation.	$ 750.00
620B	Same as above but later model.	$2200.00
626A	10 to 15GHz,10mw output power with calibrated output and pulse-square wave or FM modulation.	$4200.00
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BITS AND PIECES

I have an old Apple II computer. According to the date stamped on the circuit board, it was manufactured in late 1979 (I purchased it in early 1980). In the four years I have had it, it has performed flawlessly—until just recently.

The P and the L keys started to "bounce." Sometimes I would get two or three Ps or Ls when I only wanted one. I ran over to a local computer repair shop and purchased 2 keyswitches. When I returned home, I had to figure out how to take the Apple apart to get at the keyboard—a task that isn't too difficult if you know which screws to remove! To save you from possible aggravation if the need ever arises to take *your* Apple apart, I will describe how it is done. Please note that this information only applies to Apple II computers; Apple *//e* computers are constructed differently.

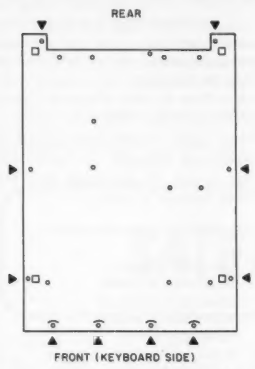

Fig. 1. Underneath an Apple. Arrows indicate screws to remove.

Start by disconnecting the power cord from the computer. Pop the lid off and carefully disconnect all the peripheral cards, disk connector cables, etc. Unplug anything you might have plugged in the game port or the rf modulator socket.

Look at the diagram in Fig. 1. Turn your computer over and set it down on a protective surface. Remove only those screws that are marked with an arrow in the diagram! You should have removed six flathead Phillips screws and four round-head Phillips screws. Put the screws aside so you don't lose them.

After the screws are out, *carefully* lift the end labelled FRONT in the diagram up a few inches. It should hinge open. You will notice a DIP connector connecting the keyboard assembly to the main assembly. Using extreme care, gently unplug this connector from the main board and note its orientation (you'll be putting it back later!).

After you have disconnected the keyboard connector from the main board, you are ready to lift the bottom off completely. Set it down in a safe place (where no one is likely to step on it).

Next, to remove the keyboard from the case, simply remove the screws at each of the four corners of the board. If your Apple is a fairly recent one, you will notice that the keyboard has a "piggyback" board connected to it. Removal of this piggyback board is a bit tricky. Locate the two white plastic posts that extend through it. You will notice that these posts serve to hold the boards together by means of tiny plastic expanding tabs. With a needle-nose pliers, squeeze these tabs together to unlock the posts from the board. Carefully separate the boards, taking care to notice that a 25-pin connector must also be separated. To replace this board, first align all of those 25 fragile pins into the proper holes and then push the boards together firmly to lock the plastic posts.

That's all there is to disassembling an Apple. The procedure is fairly simple; about the only tricky thing is removing the piggyback board from the main keyboard. While you're inside your computer, you might want to give the insides a thorough cleaning. You'd be amazed at the amount of dust, dirt, hair, and assorted particles that find their way into a computer!

WHO'S WHO IN NEW-WAVE MUSIC

I received a post card from Wilbur T. Golson W4AV regarding my April column. He said: "Re: 'The End of Amateur Radio': I agree with your thoughts one hundred percent, but the majority of hams don't. I feel that the code test should have been dropped and the technical tests and rules beefed up to keep with today's modern technology. The FCC feels the same way, but it seems that the 'I had to learn it, so you should, too' attitude is far too common. I don't know who David Byrne is, but he may be right . . ."

The reference to David Byrne is regarding a quote I used in the April column: "Watch out, you might get what you're after." For those of you who *don't* watch MTV (and I certainly don't hold that against you), David Byrne is a new-wave musician whose group The Talking Heads sings that line in one of their songs. Next time I'll know only to quote well-known people.

While I'm on the subject of mail, I received a number of interesting ideas in a letter from Charles W. Creasy III (who neglected to give his callsign) concerning the need for a computer operating system designed for amateur radio. Features that such an operating system might incorporate are conversion from one code to another (ASCII, Murray, EBCDIC, AMTOR, etc.) and real-time control of amateur-radio hardware (transmitters, receivers, antenna rotors). One could program amateur-radio applications in the high-level language of his choice and perform any needed function with calls to the operating system. Such programs could be made machine-independent; the operating system, customized for a particular computer, would take care of hardware differences.

The concept of an amateur-radio operating system is an intriguing one. If anyone has implemented anything along these lines, I would like to hear about it. In the meantime, I think I'll look at the feasibility and practicality of such a system. I

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can see the value of such an operating system for applications other than amateur radio. Many computer interface problems are due to a poor communications interface, and computer-to-computer communications over media other than ham radio is a rapidly growing field.

CONNECTING A COMPUTER TO THE OUTSIDE WORLD

In some of the mail I've received, I have noticed a common problem in interfacing a computer to another device. Much of the confusion is focused on the computer's end of the interface—most hams know how to interconnect ham equipment without too much difficulty.

Most home computers use TTL logic circuitry. These components work with two voltages: +5 volts (or a bit below it) and 0 volts (or slightly more). These two voltage levels are used to represent the zeroes and ones that a computer thrives on. As you probably know, computers represent numbers and symbols with binary numbers. A binary number is a number in base 2 and is written using only the symbols 0 and 1. As with the more familiar base-10 numbers, the value of a particular digit depends on its *place* within the number. For example 0101 would be the number five in binary; there is a one in the ones place and a one in the fours place, adding up to five.

What do binary numbers have to do with computer input and output (I/O)? Everything! Remember that the ones and zeroes are represented within the computer's hardware by the presence or absence of electrical current. By connecting special circuitry to look for specific patterns of current on a computer's internal data lines, devices can be controlled with computer commands. It is this principle that is the basis for all computer interfacing.

Let's look at how the built-in I/O ports on an Apple II computer work. The 6502 microprocessor in an Apple II has 16 "address lines" and 8 "data lines." These lines are simply connections on the microprocessor chip that are used to signal a particular memory address or 8-bit data item to the other components of the computer. By having different patterns of on and off voltages on these connections, different memory addresses and data items can be specified.

Usually, the address lines are decoded by the memory chips; when the circuitry associated with the memory chips sees a particular voltage pattern on the address lines, the data contained at the location specified by that pattern is fed into (or taken from) the 6502's data lines.

Memory chips are not the only components which can interpret the information contained on the address lines, however. It is possible to have other circuits recognize certain addresses. The designers of the Apple II computer used this principle to control the four output lines and three input lines on the computer's "Game I/O Connector." Circuitry inside the Apple looks for certain voltage patterns and uses the presence of certain ones to switch the four outputs on or off. For example, placing the binary pattern 1100000001011000 will turn output number 0 off; the pattern 1100000001011001 will turn it on.

You're probably thinking, "How am I going to get the 6502 to put that bit pattern on the address lines?" The answer is remarkably simple. Just have the computer execute any statement that references that address.

It so happens that the two binary bit patterns mentioned before correspond to the numbers 49240 and 49241 in the more familiar base-10 notation. So, if we execute the Basic statement Q = PEEK (49240), we can flip that output off. Similarly, the statement Q = PEEK(49241) will turn it on. Note that the value assigned to Q is meaningless. It is simply the *reference* to the memory location that does the work. Any variable can be substituted, and the result will be the same.

The off/on locations for the other three outputs are: 49242/49243 (output 1), 49244/49245 (output 2), and 49246/49247 (output 3). Outputs 0 through 3 correspond to pins 12 through 15 on the game port connector.

The Apple also has three inputs that work in a similar manner. By using the Basic PEEK command for locations 49249 through 49251, a value can be obtained to indicate if the input is "high" or "low" (0 or 1). For example, the command Q = PEEK(49251) will assign Q a value less than 128 if the input is high and a value greater than or equal to 128 if the input is low.

Caution: These input and output lines are designed to handle the special voltage and current levels used by the computer chips. Do not attempt to connect any device to these I/O lines without the appropriate interfacing hardware.

Next time, I'll describe how to properly interconnect computer I/O ports with other devices. I'll also cover Atari and TRS-80 computer I/O ports.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

RADIO AND ELECTRONICS PIONEERS

It is natural that one should wonder whether the wireless telephone is destined to displace our present apparatus [telegraphy]. This does not seem at all probable. In the first place, wireless telephony is now, and probably always will be, very expensive. Wherever the wire will do, it is the more economical... Millions of messages going in all directions, crossing and recrossing one another, as is done every day by wire, are probably an impossibility by radio telephony. Weird and little-understood conditions of the ether, static electricity, radio disturbances, make wireless work uncertain, and such a thing as twenty-four-hour service, seven days in the week, can probably never be guaranteed.—Walter Kellogg Towers, *Masters of Space*, 1917.

Don't you just love the predictions of so-called experts? Every time I read a newspaper article or see a television report predicting the future of the electronics industry, I think of the preceding quote.

Fortunately, the subjects of this month's column—radio and electronics pioneers—didn't hold the same beliefs as Mr. Towers. These were men who were willing to take chances on a dream. They didn't care if their goals meshed with the expectations of society. If they did, our shacks would probably consist of little more than paper cups and strings. (I've got a Dixie HW-101, how about you?)

So let's learn a little bit about the people who made our hobby what it is today. And let's all remember how they bucked the advice of the experts. Ham radio could use a little more of that attitude today.

ELEMENT 1
MULTIPLE CHOICE

1) Which of the following devices was an invention of Sir Hiram Stevens Maxim, father of ARRL founder Hiram Percy Maxim W1AW?
1) Radioscope
2) Self-regulating generator
3) Carbon resistor
4) All of the above

2) Which of the following men first proposed naming the two electrical poles "plus" and "minus"?
1) Thomas Edison
2) Henry J. Faxton
3) Michael Faraday
4) Benjamin Franklin

3) English philosopher and chemist Joseph Priestly:
1) Proposed the inverse square law
2) Invented the galvanic jar
3) Discovered the unit of quantity
4) Developed the practical nicad cell

4) German physicist Thomas Johann Seebeck discovered the "Seebeck Effect," which eventually became known as:
1) Radiation
2) Thermal electromotive force
3) Electricity
4) Static discharge

5) Samuel Morse constructed his first telegraph from:
1) Aluminum
2) An old picture frame
3) Bits and pieces of old newspapers
4) Scrap iron

6) Name the two actors who portrayed Thomas Edison in MGM movies during the 1930s.
1) Spencer Tracy, Don Ameche
2) Raymond Massey, Cedric Hardwicke
3) Mickey Rooney, Spencer Tracy
4) William Powell, Humphrey Bogart

ELEMENT 2
MATCHING

Match the names in column A with the inventions in column B.

A	B
1) deForest	A) Radar
2) Fleming	B) Television
3) Fessenden	C) Teleprinter
4) Baekeland	D) Radiotelephony
5) Hilliard	E) Triode
6) Affel/ Epensched	F) Diode
7) Stanley	G) FM radio
8) Shockley/ Brittain/Bardeen	H) Magnetic detector
9) Armstrong	I) Transistor
10) Taylor/Young	J) Bakelite
11) Berliner	K) Heterodyne
receiver	L) Radio beacon
12) Elster	M) Tape recorder
13) Poulsen/ Fessenden	N) Photoelectric cell
14) Marconi	O) Circuit breaker
15) Zworkin	P) Multigrid tube
16) Alexanderson	Q) Ac transistor
17) Poulsen	R) Static power
18) Morkrum/ Kleinschmidt	S) Coaxial cable
19) Donovan	T) Cascade tuning
20) Langmuir	U) Microphone

ELEMENT 3
TRUE-FALSE

	True	False
1) Zenith, the famous electronics company, derives its name from an amateur call.	____	____
2) The callsigns of the first two FM broadcast stations were KE2XCC and W2XMN.	____	____
3) David Sarnoff, founder of RCA, first rose to national attention by relaying distress messages from the ill-fated RMS Lusitania.	____	____
4) The first US broadcast radio station was WPLJ in Albany, New York.	____	____
5) During World War I, the US Navy's primary school for wireless operators was located at Harvard University.	____	____
6) At the time he discovered radio, Marconi was only 29 years old.	____	____
7) Lee deForest went bankrupt at the age of 33.	____	____
8) Reginald Fessenden was an adopted son of Thomas Edison.	____	____
9) Michael Faraday, of unit of capacitance fame (the farad), died in 1967.	____	____
10) The coulomb—the unit of electrical quantity—is named after Charles Augustin Coulomb (1736-1806).	____	____

ELEMENT 4
SCRAMBLED WORDS

Unscramble these names of radio and electronics pioneers.

RAMINCO	YARAFAD	LAVOT
RETZH	HOM	ROSEM
PRAMEE	YARAFAD	SLATE

THE ANSWERS

Element 1:
1—2, 2—4, 3—1, 4—2, 5—2, 6—3.

Element 2:
1—E, 2—F, 3—K, 4—J, 5—O, 6—S, 7—Q, 8—I, 9—G, 10—A, 11—U, 12—N, 13—D, 14—H, 15—B, 16—T, 17—M, 18—C, 19—L, 20—P.

Element 3:
1—True From the call of the company's founder, E. F. McDonald 9ZN (originally ZN-ith Radio Products).
2—True The experimental stations run by Armstrong in New York and New Jersey.

3—False It was the Titanic.
4—False KDKA in Pittsburgh, Pennsylvania.
5—True Harvard was a major training center for the War Department during the Great War.
6—False He was only 22!
7—True But he made up for it later.
8—False Hardly. He was the son of a Canadian minister.
9—False 1887.
10—True The one and only.

Element 4:
(Reading from left to right) MARCONI, EDISON, VOLTA; HERTZ, OHM, MORSE; AMPERE, FARADAY, TESLA.

SCORING

Element 1:
Four points for each correct answer.
Element 2:
Two points for each match.
Element 3:
Two and one-half points for each correct answer.
Element 4:
Two points for each name unscrambled.

1–20 points—Still in the Dark Ages
21–40 points—Communicator
41–60 points—Radio cadet
61–80 points—Academician
81+ points—Son of the pioneers

HAM HELP

I need a schematic and any technical information on an SBE SB-144 two-meter crystal-controlled transceiver. I will pay any and all copying and postage costs.

Dick Roux N1AED
25 Greenfield Drive
Merrimack NH 03054

Help! I now own a working NC-109 general-coverage receiver. I need information about it so that when it no longer works, I can find out why. (Also, I may want to perform modifications to it.)

Also, I have been having a terrible time trying to connect a Western Electric #1035C3A-type touchtone™ pad to a 500-type telephone set. Any help at all will be greatly appreciated.

Thanks a lot.

Andrew W. Gaunt
52½ Washington Street
Newburyport MA 01950

Help! I am a Novice and I need the manual (or a copy) for the Heath model HW-16 and any modification for HW-16, and also the manual (or a copy) for the Heath VFO-1. I will gladly pay postage and copying costs.

Edward Molser KA2IVD
4376 Coolidge Rd.
Coleman MI 48618

I need an operating or technical manual for a Nems-Clarke Spectrum Display Unit, model 200-3. The unit is a narrow-bandwidth spectrum analyzer, apparently used by the military to monitor the 30-MHz i-f output of UHF or microwave converters. I will pay reasonable copying costs.

My thanks to you for your service. I have utilized "Ham Help" once before and got many offers of help, including long-distance phone calls. Since then, I have helped several others using your service.

Bob Lombardi WB4EHS
2046B Renee Place
Melbourne FL 32935

I have been a subscriber to *73* for over twenty years. I now have a problem which you might be able to help me with. I am looking to locate a published article or other information concerning the effect of radio frequency transmissions on an implanted heart pacemaker.

Your help will be greatly appreciated.

Maurice J. Hindin W6EUV
10471 Le Conte Avenue
Los Angeles CA 90024

SATELLITES

RS-5		RS-6		RS-7		RS-8		
UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
0142	172	0006	154	0028	155	0044	153	1
0136	172	0150	182	0019	154	0041	154	2
0131	172	0134	179	0009	153	0038	155	3
0126	173	0119	177	0158	182	0036	156	4
0120	173	0103	175	0149	181	0033	156	5
0115	173	0048	172	0139	180	0030	157	6
0110	173	0033	170	0129	179	0027	158	7
0104	173	0017	168	0120	178	0024	159	8
0059	174	0002	166	0110	177	0021	160	9
0053	174	0145	193	0100	177	0019	160	10
0048	174	0130	191	0051	176	0016	161	11
0043	174	0114	188	0041	175	0013	162	12
0037	174	0059	186	0032	174	0010	163	13
0032	175	0044	184	0022	173	0007	164	14
0027	175	0028	181	0012	172	0004	164	15
0021	175	0013	179	0003	171	0002	165	16
0016	175	0156	206	0152	200	0159	196	17
0011	175	0141	204	0142	199	0156	197	18
0005	175	0125	202	0133	198	0153	198	19
0000	176	0110	199	0123	198	0150	199	20
0154	206	0054	197	0113	197	0147	199	21
0149	206	0039	195	0104	196	0144	200	22
0144	206	0024	192	0054	195	0142	201	23
0138	206	0008	190	0044	194	0139	202	24
0133	207	0151	218	0035	193	0136	203	25
0128	207	0136	215	0025	192	0133	204	26
0122	207	0121	213	0016	191	0130	204	27
0117	207	0105	211	0006	190	0127	205	28
0112	207	0050	208	0155	220	0125	206	29
0106	208	0034	206	0146	219	0122	207	30
0101	208	0019	204	0136	218	0119	208	31
0056	208	0004	201	0126	217	0116	208	1
0050	208	0147	229	0117	216	0113	209	2
0045	208	0131	226	0107	215	0110	210	3
0039	209	0116	224	0057	214	0108	211	4
0034	209	0101	222	0048	213	0105	212	5
0029	209	0045	219	0038	212	0102	213	6
0023	209	0030	217	0028	212	0059	213	7
0018	209	0014	215	0019	211	0056	214	8
0013	209	0158	242	0009	210	0053	215	9
0007	210	0142	240	0000	209	0051	216	10
0002	210	0127	238	0149	238	0048	217	11
0156	240	0112	235	0139	237	0045	217	12

CORRECTIONS

The address for the SW station in Norway, page 49, *73* for April, 1984, should be: Radio Norway, Oslo 3, Norway.

Roger N. Peterson
New Canaan CT

Have you placed your vote for *73*'s best advertisement of the month? To do so, simply turn to the reader service card and fill in the company name and reader service number.

73 INTERNATIONAL

from page 62

to be noted is that under the strong pressure and reaction of the amateurs, the Post and Telecommunications Ministry (MPT), has warmly invited the ARI directors for a friendly exchange of opinions for the first time in Italian radio-amateur history; opening its golden doors to hams, it has made a descent from its throne, receiving their representatives and discussing their problems in the presence of the Minister of Posts, Senator Gava, and the MPT general manager, Dr. Monaco.

Together with beautiful words on the importance of the amateur-radio service, on its social values, etc., words which were absolutely unheard before, as a first step the MPT released the 160-meter band, the 18- and 24-MHz bands, and promised the 10-MHz band (with some frequency limitations) in a very short time. Moreover, the MPT promised to authorize in very short time the 144-and-up repeater network, the free transfers of stations, and mobile operation.

The more controversial matter appears to be the 3.5-MHz band, as the MPT proposes for amateur use only a segment of 100 kHz. A very important and perhaps decisive meeting between the ARI and the MPT will take place soon. I hope to be able to announce a complete amateur victory in the next column.

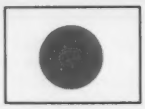
The most important observation which should be made on this "Italian Affair" is that in a free and democratic country, the radio amateur's community, even if small, like any other citizen's community, can safeguard its own rights while fighting against forces which, at first, could be judged not suitable to be attacked, like powerful government agencies—telecommunications, military, etc.

The Italian amateurs, who had been judged weak and inoffensive by the administration (and just for that reason were kept for decades in a substandard position), suddenly raised a fierce and strong protest when the 3.5-MHz band was practically closed. The battle started from this point and was extended to the other controversial areas like repeaters, mobile operations, and so on.

Open discussions on these matters were kept on the air, a very sharp protest against the MPT, and the ARI, whose action was judged weak and ineffective, then started writing in the technical magazines. Groups of amateurs, and I was among them, started to organize actions through radio, TV, newspapers, and weekly magazines. A petition with thousands of cards, telegrams, and letters was directed to the President of the Republic, Sandro Pertini. The echo of this big noise filtered through the MPT walls, and the MPT, surely fearing negative public opinion, suddenly changed its own behavior in such a way that it was the first to contact the amateurs in order to modify the clamor they were raising.

At present, we are strongly believing that almost all our targets will be hit.

I think that the "Italian Affair" will make history, and also I believe it should be studied deeply wherever similar problems arise in other countries.



JAPAN

Roy E. Waite W9PQN
Tomigaya Grand-301, 2-19-5 Tomigaya
Shibuya-Ku
Tokyo 151
Japan

AN INTERVIEW WITH SHOZO HARA JA1AN

(JA1AN is President of JARL—the Japan Amateur Radio League, Inc.)

Waite: How many members does the JARL have at present?
Hara: We have 131,000 members. And here in Japan at present there are 565,000 amateur stations.

Q: I know that Japan is now number one in the world in the number of amateur-radio operators. Are the members of the JARL increasing year by year? What is the trend?
A: Yes, there is a gradual increase.

Q: Is it a large increase? About what is the percentage of the yearly increase in membership?
A: Until now the yearly increase has been tremendous, but these days the increase in membership has been slowing down.

Q: Throughout the years, the JARL has accomplished many, many things. Could you just tell us about a few of the more important accomplishments? For instance, I know that the JARL succeeded in getting a "window" at 3.803. That was due to the JARL efforts, wasn't it? What do you think were the most important accomplishments?
A: Let's talk about frequencies. In 1952, when amateur radio was again reopened after the war, the JARL succeeded in getting permission to operate on 14, 21, 28, 50, and 144 MHz. On 40 meters we were given only two channels, which were 7,050 and 7,087.5. Then in December of 1956, 40 meters became a real band and we could then operate from 7.0 through 7.1.

Q: Were you the JARL president during that period?
A: No. At that time I was a director.

Q: I see.
A: In 1955 we got 3.5 MHz. In 1956 we got 435 MHz and 1.8 MHz. Year by year, the JARL succeeded in obtaining more frequencies. About ten years ago we obtained the "window" at 3.803 which you mentioned earlier.

Q: So all of these came step by step.
A: Yes. After that we got 1200 MHz. And then 5 GHz, 2 GHz, and others. All of these came gradually.

Q: Now, moving to more recent accomplishments, one of the things that comes to mind is repeater operation.
A: Yes, we finally got government permission in 1982, and repeaters first appeared last year, 1983. We had been working on that for 20 years!

Q: Why was it so difficult to get government approval for repeaters?
A: In Japan, domestic communications are controlled by NTT and international communications by KDD. No one other than those two entities was allowed to operate repeaters. But we succeeded in having the interpretation of the rules relaxed somewhat in order to accommodate amateur-radio operation of repeaters.

Q: How many times did you visit the Ministry of Posts and Telecommunications (MPT) before you finally succeeded?
A: On the average, I visited the MPT once a week. At the present time, there are 150 repeaters on the air in Japan. And there are 290 repeater applications on file which will be acted upon. So sometime this year there will be more than 3000 repeaters in operation here.

Q: There is a jamming problem on the repeaters, at least here in Tokyo.
A: Yes. Well, especially your club, TIARA, has problems because your repeater is located on top of Hotel Okura, one of the highest points in Tokyo. The question is, what are we going to do about all the trouble we have been having with this repeater? I have talked to the MPT about this. What we are thinking is to add some repeaters around the hotel to cover almost the same area, so that the number of users on each repeater would be somewhat diluted. The TIARA repeater gets out so far and so well that it attracts a lot of users.

Q: We get the impression that because we are speaking English on this repeater, we are deliberately jammed. I can't imagine the same situation in America, although I have heard there are some jamming problems there, too.
A: Well, it's true that the TIARA repeater is having more trouble than other repeaters. And while it is true that English-speaking hams on that repeater do attract some troublemakers, it is not the main reason for the trouble. The main reason is that it is right smack in the middle of Tokyo, probably the world's most populous city, ham-wise, at least. And it is at the highest point in Tokyo, so it covers a very wide area. We think that if a lot more repeaters go on the air in this area, most of the troubles will disappear.

Q: Did you hear about the incident the other night where employees of Hotel Okura actually apprehended a taxicab driver near the hotel who was jamming the repeater?
A: Yes, I heard about that. We know about that and other incidents, as well. We inform the MPT about all of these problems.

Q: Let's talk about the progress in the reciprocal license field.
A: We really thought we could accomplish a reciprocal agreement with the US in early 1982, but here it is 1984 and we haven't succeeded yet. The plan is to begin by having the first Japanese reciprocal agreement with America. Somehow or other we haven't been able to settle certain matters. So we don't have anything yet.

Q: I have heard that the ball is on the US side now. Is that right?
A: Well, actually the problem is here in Japan. In this country, we have a separate station license, separate operator's license, station inspection, and complicated application procedures. In America, you don't have to contend with all of those things. In Japan, to go on the air, there is a mountain of bureaucratic red tape to get through. In America, it's relatively simple, as it is in Germany, too. This is a very difficult problem to overcome.

Q: Do you think it is arrogant of the US to insist on Japan changing its rules to match the American side?
A: No, I don't. Reciprocal means "same." Same rules and procedures. So we're trying to come up with a way to simplify the procedures. The law was changed in the Japanese parliament in 1981, so the stage has been set. The problem now is how to apply the law and to work out details of applying for permission and regulations and restrictions that will apply.

Q: So when do you think we can expect to see a reciprocal agreement with America?
A: I had been hoping for March of this year, but some people are saying it won't come until June or July.

Q: Now on to other items. In 1958, the licensing structure was changed dramatically in Japan with the introduction of a no-code class. This was an accomplishment of the JARL, wasn't it?
A: In 1982, when ham radio was again allowed in Japan after the war, we had only first- and second-class stations, with power limited to 500 and 100 Watts respectively. So the JARL came up with a plan, in 1957, to add two new classes, with power limited to 10 Watts. One was a phone, no-code license, and the other was a CW-only license. This was approved by the government in 1958.

Q: Did you play a part in this, Mr. Hara?
A: Yes, I was the main force behind that.

Q: When did you become president of the JARL?
A: Well, I was already involved with the JARL in 1941, and in 1946 I was working at the head office, although it is misleading to say "working," as I didn't receive any pay. At that time we were working on getting permission to have ham radio restored in Japan. I became a director in 1952, vice-president in 1964, and president in 1970.

Q: So you have been president now for 14 years. Is it a satisfying job being president of the JARL?
A: Yes, I enjoy it very much, although it keeps me very busy.

Q: I know you are already very busy at Mitsubishi Heavy Industries in your regular occupation. What is your job there?
A: My title is Chief Engineer, Shipbuilding and Steel Structures Headquarters.

Q: So I would imagine that this job keeps you very busy.
A: Yes.

Q: How do you find time for the JARL activities?
A: It seems that I am on the go from morning until late at night. As for the company, if there is nothing special going on, I work from 8:00 am in the morning until 10:00 pm at night. During those hours I squeeze in JARL affairs. The company is closed on Saturday, but if there is nothing for me to attend to at the JARL, I go to the Mitsubishi Heavy Industries office.

Q: Do you go to the JARL office every day?
A: No, I don't, but I am in frequent contact with the JARL officials as necessary.

Q: Is it true that most of the directors are retired MPT employees? I heard a rumor about that some time ago.
A: No. Not true. There are 20 directors, but not even one is from the MPT. Among those 20 directors we have one president, two vice-presidents, a general secretary, and 16 other directors, 10 of whom reside in the outlying call areas. The other six reside in Tokyo. Also there is one auditor.

Q: Do the directors receive a salary?
A: No. Nothing.

Q: Are you, Mr. Hara, paid for your services?
A: No. Nothing at all. In fact, I sometimes have to spend some of my own money. Even when the JARL holds a party, I have to pay the admission fee like everyone else. The directors are volunteers and don't receive a salary. But we have 140 employees in the headquarters here in Tokyo who are paid a salary.

Q: Are there any salaried employees in outlying areas?
A: In the JA2 area there are three; in the 3 area there are eight; in the 4 area there are

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Amtorsoft

For the serious AMTOR operator using a VIC-20, Commodore 64, or Apple computer. This program is similar to Hamtext in capabilities, but can only be used for AMTOR. The Apple version includes both Hamtext and Amtorsoft on one diskette ($139.95), while the Vic-20 and Commodore 64 cartridge is just Amtorsoft ($89.95).

two; in the 5 area there are two; in the 6 area there are three; and so forth. Those people receive a salary from the JARL. Total for the year is about 400,000,000 yen.

Q: One of the recent accomplishments has been in the area of amateur examinations given in this country. It used to be that Japanese could take the exam only twice a year. But the JARL succeeded in expanding the exam schedule. Did you play a part in that, Mr. Hara?

A: Yes, I did. I suggested to the Ministry that they give the examinations every day instead of twice a year. But they said money was the problem. Thereafter, a separate entity was established called the "Examination Center" to which the JARL contributed 100,000,000 yen. This was established in Tokyo only, but soon there will be examination centers like that throughout the country.

Q: On a different subject, I have heard Japanese as well as foreign hams state that one of the problems here is the large number of Novice phone-class hams and their bad behavior at times. What do you think about that?

A: I don't agree with that at all. It depends on the individual, not merely on the class of license they happen to hold.

Q: Mr. Hara, when did you first become interested in ham radio?

A: I first became interested in ham radio in 1938 and I became a ham in 1952, with my present callsign, JA1AN.

Q: May I ask how old you are?

A: I am 57; I was born on September 26, 1926.

Q: What bands are you active on, Mr. Hara?

A: Well, I'm too busy to be very active on the air, but when time permits, I like to get on 6 and 2 and 430 MHz.

Q: Are there any other hams in your family, Mr. Hara?

A: There certainly are. My wife, Yoshiko, is JA1ECQ, my daughter, Hisako, who is married and has a child, is JG1QIK, and my son Keizo is JG1WTK.

Q: Do you have any hobbies besides ham radio?

A: Yes, I am an equestrian. I like to ride horses and I belong to a riding club, and I ride whenever I can find the time.

Q: On behalf of 73 magazine, I'd like to thank you for taking the time from your busy schedule to talk with us today.

A: Thank you. It was my pleasure.

LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Liberia

AMATEUR RADIO IN LIBERIA

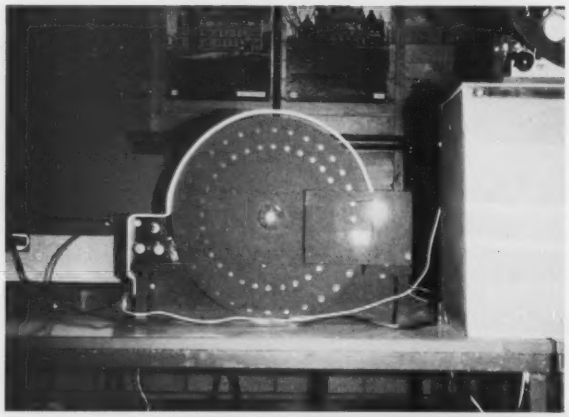
It is not difficult for an American to obtain an amateur-radio license in Liberia. If he holds an American license that is current, he simply presents it at the Ministry of Post and Telecommunications and receives the equivalent Liberian license. Under normal circumstances this can happen within twenty-four hours. If he does not hold a current American license, he will receive his Liberian license upon having passed examinations in international Morse code and in amateur-radio theory. The theory examination consists of basic electronics, national and international regulations concerning amateur radio, and common amateur practice. In general, these tests are very similar to those given in the States.

Regulations and procedures for obtaining amateur licenses differ from one country to another, and it is not surprising that some countries restrict the privilege of operating amateur radio to their own citizens. An expatriate simply cannot obtain a license at all. It is necessary, therefore, for any given country to investigate the requirements of that country.

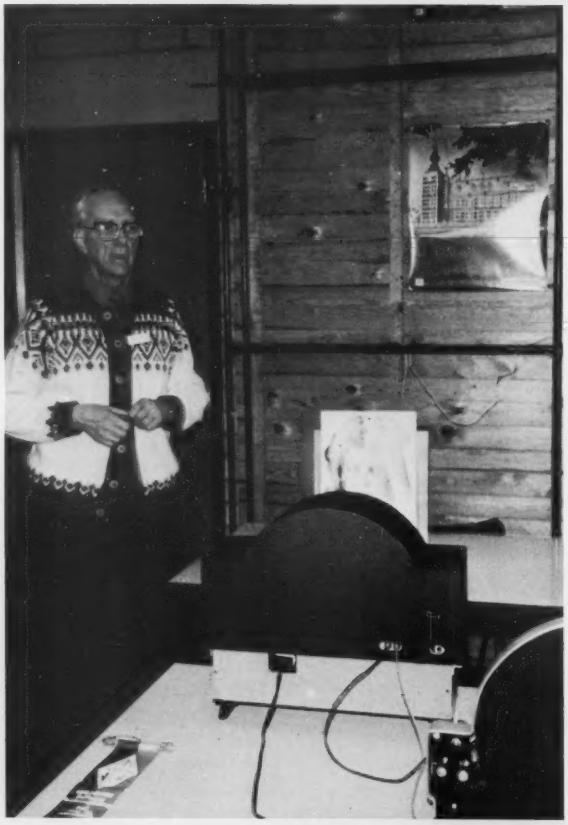
The office of the Ministry of Post and Telecommunications of Liberia is located in the post office building in Monrovia. It is open every working day and there is always someone there to give service or direction.

If the person who is seeking an amateur-radio license is in need of instruction, he may go to the Ministry and make known his needs. They will direct him to a place where instruction is available, and it is free. There are two organized classes in amateur radio in Monrovia each year, and individual instruction is available for anyone who is not able to attend one of the classes. Like courses are being organized in some of the other cities.

In Liberia, the amateur-radio association has been entrusted with the task of instructing and testing applicants for an amateur license. The president and his officers are very generous with their time and will schedule an examination for *one person* if the need arises! Whatever the case may be, when an applicant has passed the examinations, the exam papers with the grade are sent to the Ministry along with a letter recommending that the applicant be given his license and call letters, and this is usually done within a day.



Nipkov disk in action.



A. Meijer and homemade gear.

In this country, there are only two classes, the Novice and the General. The Novice class has privileges similar to the Novice class in the States—with one notable exception. Here, the Novice may operate phone at 7.060 MHz; this is the frequency used by the West African Net and so allows the Novice to take part in the net activities. In Liberia, this becomes very important because the net is a vehicle for passing messages from one part of the country to another.

The General class has all the privileges which are allowed to amateur radio in Region I. There is no higher amateur license in Liberia. It is a fact, however, that when a Liberian General license is presented for the equivalent American license under the reciprocal agreement between the two countries, it is the American General license that is awarded, not the Extra.

There are many Americans who come to Liberia and establish residence for two or three years—or for much longer. The greatest number of these are missionaries, but there are also Peace Corps volunteers and businessmen as well as members of the diplomatic service. Many of these people look to amateur radio as a means of keeping in touch with home. This article should be a real help to them. On a much broader spectrum, chances are that American amateurs will enjoy just knowing how it is done in another country.

Should anyone wish further information, please feel free to write to me personally at the address given above.

THE NETHERLANDS

Henk Meerman PD0DDV
Zandvoorterweg 33
2111 GR Aerdenhout
The Netherlands

In the December, 1983, issue of this magazine, I told you about the NBTVA (the Narrow Bandwidth Television Association), a club with only a handful of enthusiastic members with two things in common: ham radio (most of the NBTVA members are hams) and a desire to construct mechanical television equipment.

The parts that they use are Nipkov disks, mirror drums, motors, etc. As a member of this association, I made a recent visit to the meeting that they hold once a year. This year the meeting was held in the southern part of my country, in the city of Eindhoven. I'll give you a full report of what there was to see.

On the 18th of March, some fellow hams and my YL and myself, of course, drove by car to Eindhoven. Because it was on an early Sunday morning when we started, it was very quiet on the roads and that's why we had a safe journey to Eindhoven and the club where the meeting was. All we had was the address, but, as promised, a friendly operator was listening for any visitors, and when we gave a shout on 145.15 MHz, we got an immediate response from PA0PWA, who talked us to the right spot.

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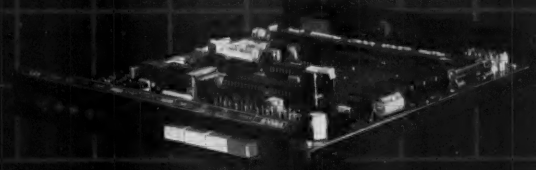

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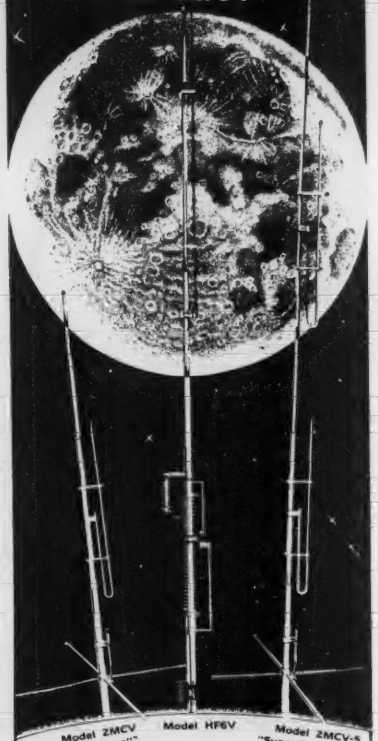

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A. Meijer and his Nipkov disk.

A. Meijer and his NBTV monitor.

When we entered the building, we got a warm welcome from Mr. A. Meijer, the president of NBTVA, and his wife. He had brought some nice gear: a camera and separate monitor, both with Nipkov disks, all homemade and all in working condition. Most members use Nipkov disks made by Mart Schouten PA0MJS.

Mart, who in daily life is a mechanical designer, makes the Nipkov disk with an almost unbelievable accuracy. He uses aluminium for less weight. Since it is a hell of a task to make a good Nipkov disk, most of the members knock on Mart's door to buy one from him.

Mart brought a single monitor (television) with an antique-style wooden cabinet and a combined camera/monitor which was a real piece of craftsmanship. We also had a chance to see a part of the original equipment as used in the early days of TV by PA0DXY. PA0DXY made broadcasts with narrowband TV in 1935 and 1936. Before we went home, I got good advice from Mart about how to improve my equipment, and I bought one of his new-design disks.

THE EVOLUON

Being in Eindhoven, we took the opportunity to visit the Evoluon. Evoluon is the name of a building where a permanent exhibition is held about science, communications, computers, energy, and mathematics. When you visit Holland, it is a must to see it. It gives you a good example of the state of the Dutch electronics industry today, and it is presented in a popular way so that even minors can enjoy it.

The Evoluon is owned by Philips Company, the well-known manufacturer of electronic equipment in Holland. It has its own amateur-radio station with the callsign PE2VO; it is active on most of the ham bands.

After this visit we drove home, arriving at 6:00 pm. We looked back on a very interesting and nice day, although we were all a little bit tired because we had an early start.

NEW ZEALAND

Des Chapman ZL2VR
439 Kennedy Road
Napier
New Zealand

SIX METERS DEAD! SUNSPOT CYCLE 21 GONE!

That's what everyone was saying, but after the ZL summer "silly" season, six meters is far from from dead, even if sunspot cycle 21 has gone. From Kerry ZL2TPY, New Plymouth, this report on some of the six-meter activity over the period mid-December to the end of February shows that 6 was very active in this area.

Within that period, Kerry worked about 720 QSOs with just over 200 different stations in 29 countries, which included VKs 1 through 6, 8, and 9, JAs 0 through 7, FK8, FK0, H44, 3D2, YJ8, ZL8, ZL4/C, and all ZL Districts. All the contacts were worked using 10 Watts USB into a home-brew 5-element yagi, 50 feet up on a hill, one mile from the sea at New Plymouth.

New Plymouth, on the west coast of ZL's North Island, appears to be the "Hawaii of the South" for ZL–VK contacts. (It must be the iron sands or Mt. Egmont attracting the signals.) Many VKs commented that ZL2TPY was the first and last signal heard each day on 6 meters from ZL and one of the strongest stations heard in many years. The same location appears to be favorable also for 2 meters and 70 cm with over 50 VK2 and VK4 2-meter SSB simplex contacts notched so far.

As this sunspot cycle 21 dies away, sporadic-E and F_2 were thought to increase, which seems to be borne out by this year's summer activities, and ZL1MQ, one of our long-standing 6-meter enthusiasts, says it's the most intense sporadic-E summer he's known in 30 years of 6-meter work.

Some of the highlights of Kerry's summer activities included working back-scatter propagation on several occasions with VK and ZL stations; the QRM and pileups on 51.1 MHz with JA were just about unbelievable—about 20 times worse than a DX Field Day contest on HF. Of the back-scatter contacts, Kerry worked VK2DFW, both beaming 260°, 5/7–5/9 signals for about 10 minutes, no signals at all beaming direct, and on a couple of occasions made contacts west to east coasts of the North Island lasting about 45 minutes, all stations beaming 30°, again with no direct-path signals whatsoever. On another occasion, back-scatter was found in all directions for more than two hours, and Kerry was able to work ZL1BXH, Kaitaia, about 400 miles to the north in a direct line, both stations beaming north for a QSO which lasted about 20 minutes.

As Kerry says, "A most exciting and unpredictable band, 6 meters, and it's not dead yet."

Another possible first during all this 6-meter activity was the ZL/VK YL-to-YL QSO when Mary VK4PZ, Rockhampton, Queensland, worked Carol ZL2VQ at Kerry's QTH in New Plymouth. Another 6-meter report from Bill ZL2CD, a long-time 6-meter man, confirms Kerry's information. Bill says the summer's sporadic-E season was one of his best for many years, with the appearance of some rare DX stations. The large number and the intensity of the openings made the band more like 20 than 6 at times.

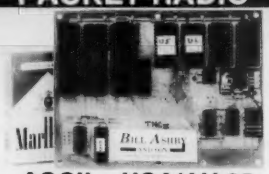
In all, during December, Bill worked numerous VKs on 24 of the 31 days in the month, as well as the following DX stations: VK0 (McQuarrie Island), VK9 (Norfolk Island), ZL4/C (Chatham Islands), FK8, P29, I44, JA, and FO8. The most common VK beacon that Bill ZL2CD in Wellington could copy almost every day in December was VK2RSY, 52.42 MHz, as well as the VK television sound on 51.74, 51.75, and 51.76 MHz.

And still with the very high frequencies, another old ZL record was broken on January 15, 1984, when the 19-year old 144-MHz overseas record changed hands. ZL3AFN, Westport, South Island, made contact with H44SR, Malaita, Solomon Islands, a distance of 3769 km (2341 miles), but before the record can be ratified, confirmation has to be received of the QSO.

BITS 'N' PIECES

By the time this column goes to press, the successful Kermadec DXpedition will be an historical event. They are there at the time of this writing and have ZLs 1AMO/8AMO (Ron), 1BQD/8BQD (Rolly), 1AAS/8AAS (John), and ZL0AJW/8, otherwise known as W6REC (Deane Ausherman, who was invited to take VK9NS's place) in the DX team. From the sounds on the bands, they are being made to work hard and long, but then that's what DXpeditions are all about when the country is so sought after by amateurs all over the world. I did hear that one member of the team fell asleep during a personal QSO with home, and as you can imagine, that didn't do down too well with the XYL. But all was rectified with a phone call the next day when he was refreshed and awake.

PACKET RADIO



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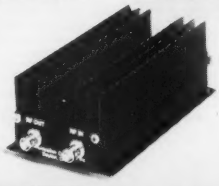

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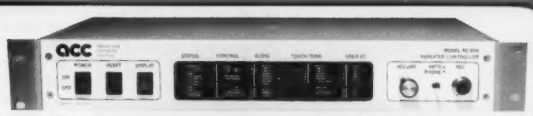

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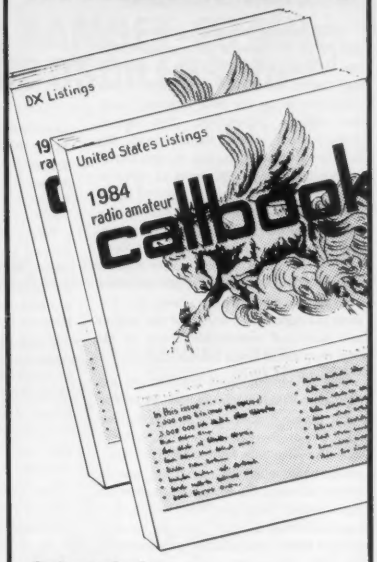

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But, remember, if you failed to work this group, don't forget Warwick ZL8AFH is resident on Raoul as a member of the Met station team located there, and, work load permitting, he will be operating as often as he can for several months yet. We all hope his rig troubles reported in the Australian column in the April 73 have been resolved.

The Kermadec Islands are situated about 600 miles northeast of ZL, and apart from the Meterological Station, are an uninhabited Nature Flora and Fauna Reserve area administered by the New Zealand Lands and Survey Department. The largest northern-most island, Raoul Island, the location of the Met Station, is also known as Sunday Island (7260 acres of volcanic origin with a large crater occupying much of its area). Though the highest point is only 1760', its surface is broken by deep ravines and rocky spurs that end at the sea as steep cliffs, which make landing a very difficult operation. The Met Station is serviced once each year by boat for main stores, etc., but there are periodic servicings of the station with mail and consumable stores by air drop from an Air Force Transport plane.

The DXpedition group travelled to the Kermadec Islands aboard the 15.5-meter yacht, *Shiner*, captained by an Englishman, John Taylor. Besides the amateurs, there were five scientists from Auckland University on board led by Dr. John Craig, who intended to carry out scientific studies on Raoul Island. Landing at Raoul Island is always extremely difficult because there is no safe beach area, shelter, or anchorage, but only rocky steep cliffs right to the water's edge and difficult sea swells most of the time. It is possible to land only in good weather conditions. After unloading is completed, the crew of the boat must stay aboard at all times in order to move the boat out should the weather deteriorate.

A few days after the party had arrived and established itself on Roaul, the weather caused the yacht's captain to move from the area near the Met Station around to the southwestern coast of the island to Boat Cove to shelter. However, the wind and seas increased and forced the *Shiner* onto the rocks at Boat Cove. The crew was able to land safely, but the *Shiner*'s ferro-concrete hull was badly holed and the yacht is now a write-off.

Plans have now to be made to evacuate the yacht's crew, the team of scientists, and the amateur DXpedition from the island when a suitable vessel is available to be diverted to Raoul Island to effect the rescue operation.

Over the years there have been amateur operators serving with the Met Station team, but the first occasion that Raoul Island was put on the air was in 1947 when Lew Sharman ZL2IC of Napier, then ZL1TZ, the Post Office radio operator with the station team, fired up the station CW transmitter on 80 and 40 meters. Later, after pondering how to get on phone with a CW-only transmitter, Lew found a way to use the modulator of the long-wave phone transmitter sitting next to the HF CW rig he was using to allow him to operate 80 phone as well. The method used (not recommended normally, of course) was to couple the HT from the CW transmitter to the modulator of the LW transmitter via a twin power cable and a wafer switch and so modulate the CW transmitter with the LW rig's modulator. Lew had many enjoyable QSOs from April to the end of the year when his tour of duty on Raoul Island ended. He was followed by another amateur in the 1948 team, when George Bourne ZL8UO was stationed on the island, but George was not very active during his tour of duty.

Old-Timers Club 50-year certificates were issued recently to O. W. Martin ZL2OZ of Dannevirke and C. J. Barnes ZL2QH of Masterton, marking milestones in their respective amateur careers.

POLAND

Jerzy Szymczak
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FM IN POLAND

Very popular in West Europe is a developed system of relay-station communication on ultra-short waves. Phased-out professional USW equipment usually gets to hams. Radiotelephones working on 144 MHz are no longer taken to pieces but are returned and used as local communications facilities. The USW Convention in Krzeszowice allocated frequencies of the FM subband 144 MHz to each province of Poland. This enabled directional antennas for attempts at long-distance communications and reduced the number of radio-frequency interferences.

The Polish firm Omig produced, and PRAA (Polish Radio Amateurs Association) distributed, several hundred sets of quartz-crystal resonators for different frequency channels. During several years of FM activity, Polish radio amateurs established many local contacts using nondirectional antennas with vertical polarization. They have been using radiotelephones as auxiliary means of communication trying to work on CW and SSB, too.

To not have too many irons in the fire, the greatest number of channels for every transceiver is necessary. Some attempts with variable-frequency oscillators or frequency synthesizers have been made. But at present it is not even possible to increase the number of channels by reduction of frequency spacing from 25 MHz to the European standard, 12.5 kHz, by reason of too broad quartz-crystal resonators or lack of them. The PRAA is going to repeat the order for crystals from Omig to improve the situation in some measure. For the time being, only one relay station, SR9E, working on R0 channel (input 145 MHz, output 145.6 MHz) enables a few hams to increase the range of their communication on the 144-MHz band. Polish hams expect that in the future they will be able to get newer types of radiotelephone and quartz-crystal resonators for 10.7 MHz, with frequency spacing at 12.5 kHz. This would create new possibilities.

NEWS HEADLINES

State Radio Surveillance informed PRAA of rules of operational use of the amateur band, 1.8 MHz. The interval between 1830 and 1850 kHz is available for holders of the first-class licenses without limitation of power. The intervals between 1750 and 1800 kHz, 1810 and 1830 kHz, and 1850 and 1930 kHz can be given if seriously requested by interested individuals.

Licenses are being brought up to date in great numbers although there are some cases of refusals. The main Verification Board at PRAA took over the function of Appeals Committee.

Work on a revision of articles for PRAA has begun.

The Presidium of PRAA has initiated preparations for elections for the National Congress of PRAA.

PORTUGAL

Luiz Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril
2765 Portugal

QRZ, THIS IS CTØBI, BERLENGA ISLAND, QRZ

As we said before, REP members CT1AFN, CT4NH, and CT4UW were active from Berlenga Island. We just received an update report about that event.

Having our very successful conversations with the Portuguese Navy and local telecommunications authorities, we got the necessary permission to operate from Berlenga Island (a natural reserve where one can find thousands of seagulls, rabbits, one donkey—known as Gerusa—and its favorite food, a very rare specimen of little flowers) with the special (very) callsign, CTØBI. It was assigned for the first time ever, so was a new one for everybody; also, the island was valid for the IOTA Award, with IOTA's reference number being EU-40.

Berlenga is the biggest of a group of islands (Archipelago das Berlengas) located 8 miles off the west coast of Portugal, at the location of the city of Peniche (50 miles north of Lisbon). It is famous for the surrounding transparent waters, making it the ideal spot for underwater exploration. There are monumental grottos like cathedrals of rock that in some cases cross through the island from one side to the other. It is 800 meters long and 300 wide, with the highest point at about 80 meters, where a lighthouse is located, under Navy jurisdiction.

Paulo CT4UW, Paiva CT1AFN, and I, and Frigate Commander Patricio, representing our sponsor (the Portuguese Navy), left for Berlenga in an old fishing boat, the *Ilha da Berlenga*, in bad weather—it was raining, with high winds, and the Atlantic Ocean was very hungry! After an hour of travel, we faced the problem of carrying all boxes, bags, masts, antennas, cables, etc., two miles to the top of the island. Fortunately (for us), Gerusa, the fat donkey, stopped for a while to eat those rare flowers and helped us with that job.

Very soon after our arrival, CT4UW and Patricio were erecting our TH3JR on the top of an existing 40' aluminum tower, still under strong winds and rain. In the meanwhile, I put up 40- and 80-meter half-wave dipoles, hanging them from the top of the lighthouse.

On March 14, at dawn, commemorating our first evening on the island, we experienced a terrible storm and a lightning hit directly on the top of the lighthouse, exactly 40 meters from the place we were sleeping! Fortunately, all rigs were left discon-

DXpedition to Berlenga Island, CTØBI. From left, Luiz CT4NH, Paulo CT4UW, Commander Patricio, and Paiva CT1AFN, REP's vice-president.

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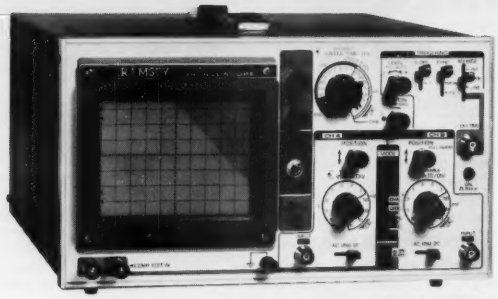

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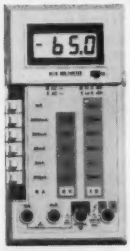

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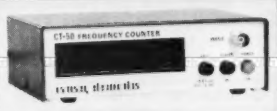

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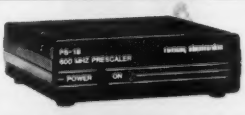

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nected from antennas and power, so we had no damage, contrary to what happened in the lighthouse where all the electric cables and motors were burned.

Due to the fact that we were authorized to use the CT0BI call only on March 16, 17, and 18, we spent two days visiting the island with its marvelous landscapes and fishing and finished final details in our shack, located in the ex-radio room of the lighthouse.

Our rigs (FT-107M, FT-DX500, FT-101E, Drake VHF gear, etc.) looked very insignificant next to the Marconi transmitters and respective power supplies. Like big refrigerators, they "looked" at our Yaesu gear with a glance of superiority.

Testing 40 and 80, we noticed a high static level (crown effect in all coax cables) which led us to reduce our activity on those bands, avoiding burnout of the finals, saving them for the other 3 bands.

Our meals were splendid because our friend, Commander Patricio, was definitively a super cook! Dish of the day: beans.

At 0000 Friday the 16th, we began CT0BI operation. The first QSO on 40 was with CT1ALF.

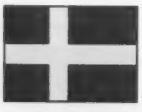
To be on the *other* side of the pileup (a sensation already experienced by the author during contests) was a new experience for the other two fellows, CT4UW and CT1AFN, respectively on HF and VHF, where they proved to be keen operators.

Being called by "hot DX" like HV3SD, T77V, and UVs on 40, plus being asked about QSL information...it's too much! We made 4071 QSOs, 1152 of them with US hams, a score possible due only to the fact that they really were very good operators.

The nice QSL cards were graciously offered by the Municipality of Peniche, and to end the story, I would like to thank Fonseca CT1CGO, who helped us from the beginning.

QSL information for CT0BI: CT4NH and CT4UW.

A brand new QSL card has been published by the Portuguese National Tourist Office, to be distributed free to licensed hams in this country. The front cover shows us a portrait of an antique map, as background, and an old Portuguese caravel of the 15th–17th century period. This color card has a very fine look, and we're really hoping for a second issue. Another effort of REP and PNTO.



SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

W5LFL VISITED SWEDEN

Together with other astronaut colleagues, Dr. Owen Garriott W5LFL visited Sweden early in February. It was a short stay without publicity, but Radio Sweden International had a brief interview with Dr. Garriott on the DX program, "Sweden Calling DXers," on February 28. SCDX is aired every Tuesday as a regular and very popular DX program on shortwave.

Owen Garriott had been in Sweden once before, in 1953, when he was in the Navy aboard the *Vincennes*. On both occasions, W5LFL and Henry SM5WK met each other in Stockholm. Over 30 years had passed between these two meetings. Friendship through ham radio! Isn't it fantastic?

NRAU MEETING IN STOCKHOLM

The member societies of the Nordic Radio Amateur Union, NRAU, are EDR Denmark, FRA Faroe Islands, IRA Iceland, NRRL Norway, SRAL Finland, and SSA Sweden. This time SSA hosted the meeting held in Stockholm on March 17 and 18, 1984. It is of great value to get together and to be able to discuss common matters on a personal basis. We were especially happy that also Martin Haasen OY7ML and Kristjan TF3KB were able to travel this far to participate in the meeting.

Beside the Nordic matters, like review of the rules for the Nordic Championship in Amateur Radio Direction Finding (ARDF) and coordination of 2-meter repeater channels for repeaters located close to national borders, most of the time was spent on the hundreds of motions from Region 1 member societies to the International Amateur Radio Union conference in Celafu, Italy, mid-April.

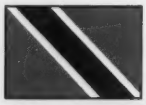
The wide variety of topics included a motion from the Radio Sports Federation, Soviet Union, "Compulsory of hosting national flags and playing anthems at the ceremony of awarding championship winners" in contrast to the one from Radio Society of Great Britain about uniformity in "the measurement and presentation of performance data on amateur HF receivers"!

ARDF NORDIC CHAMPIONSHIP

The Finnish SRAL is holding its annual summer-camp Field-Day week in Kuopio, Finland, which is in the OH7 call area. This time the Nordic Championship in Amateur Radio Direction Finding will take place during that event on July 21–22, 1984.

ANNABODA MEETING 1984

VHF–UHF–SHF enthusiasts have their summer get-together in Annaboda, a few miles west of the city of Orebro. Besides the fun of eyeball QSOing, there are a lot of antenna project activities. The antenna-gain competition is very popular. This year there will even be fox hunting (ARDF) on 10 GHz. Usually there are visitors coming also from the other Nordic countries and West Germany. This year it might be a little too early for the tourists as the dates for the meeting are June 8–10.



TRINIDAD AND TOBAGO

John L. Webster 9Y4JW
c/o Department of Soil Science
University of the West Indies
St. Augustine
Trinidad
West Indies

9Y LICENSES FOR NONRESIDENTS

We often are asked by amateurs planning to visit Trinidad and Tobago about the possibility of getting a 9Y license to allow them to operate during their visit. I shall attempt this month to outline what is involved and mention the problems faced.

At this time, the Republic of Trinidad and Tobago has reciprocity with only one other country in the world—the USA. Prior to 1976, the year that Trinidad and Tobago became a Republic, reciprocal agreements were in effect with all member countries of the British Commonwealth (UK, Australia, Canada, etc.). After 1976, these agreements were automatically cancelled. Unfortunately, the government here has not yet found it possible to renew these agreements, and this has complicated the issue of amateur-radio licenses to visiting hams. Each application from a non-US ham is, therefore, treated individually.

The TTARS has tried on several occasions to have the matter rectified but has had little success. This is apparently due to the fact that the new Telecommunications Act is being prepared.

Any US citizen visiting Trinidad and Tobago and wishing to operate here should be prepared to submit bona fide proof of US citizenship, along with both the original and photocopy of their US amateur-radio license, to the Telecommunications Officer in Port-of-Spain, the capital city. Only General-class or higher US licenses are submissible. It is not possible to apply for a license via mail, prior to arrival, as the interested party must apply in person to the officer for the license.

If the Telecommunications Officer approves, the applicant is given a letter to be taken to the Wireless Division of the Department of Customs and Excise who will then issue the license upon payment of the appropriate fee. A 9Y license costs TT$14.50 (or about US$5.95) when first issued and is renewed annually on its anniversary date at a cost of TT$9.60 (or about US$4.00). Visitors will be issued only a portable callsign, i.e., home call/9Y, unless they can provide proof that they will be resident in the country for a period of one year or more.

Any non-US amateurs visiting Trinidad and Tobago who would like to apply for a 9Y license are advised to bring with them all possible documentation to prove their qualifications, e.g., City and Guilds RAE certificate, in addition to their local license and passport. As mentioned before, each case is dealt with on its own merits and the TTARS is unable to assist in the matter.

There is, however, a more serious problem encountered by the visiting ham who wishes to enter the country with amateur-radio equipment. Unless the visitor has a valid 9Y license, the Customs Department at the port of entry will not allow the equipment to enter the country, and it will be detained until the license is obtained and produced. When the license is presented to Customs, the detained equipment will be released only either upon payment of Customs duties (30% of market value), with Purchase Tax of 45% payable on certain items such as linear amplifiers, or by posting a bond which is refundable after the equipment has been exported from the country. There are several catches related to the posting of the bond that are worth noting:

(a) The paperwork involved takes an average of ten days to complete.

(b) The services of a Customs broker are required to prepare the necessary documents.

(c) The broker must be paid for his services.

(d) It takes a minimum of three months, after the equipment is exported, before the bond is refunded.

(e) Refund of the bond cannot be made through the mail.

Unfortunately, the TTARS is unable to assist in this process at this time, although individual amateurs may be able to lend limited assistance if contacted and arrangements are made sufficiently in advance of the anticipated arrival.

NEW EXECUTIVE ELECTED

The Annual General Meeting of the TTARS was held on Monday, March 12, 1984. The following members were elected to office to serve for the 1984/85 year: president, "Nick" Percival 9Y4NP; vice-president, Ian Hart 9Y4IH; secretary, Bernard Ashby 9Y4BA; treasurer, Al Christopher 9Y4LF, and committee members, "Tony" Lee Mack 9Y4AL, Neil Wilson 9Y4NW, Frank Brooker 9Y4VU, Arnim Rudder 9Y4AR, co-opted, and Edward Hay and Denise Lee, associates.

Martin Haasen OY7ML.

RAMSEY ELECTRONIC'S Inc.

PARTS WAREHOUSE

We now have available a bunch of goodies too good to bypass. Items are limited so order today.

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Penfield, NY 14526
716-586-3950

Call your Phone Order in Today. TERMS: Satisfaction guaranteed or money refunded. C.O.D. add $2.50. Minimum order $6.00. Orders under $10.00 add $1.50. Add 6% for postage, insurance, handling. Overseas add 15%. N.Y. residents add 7% tax.

MINI KITS - YOU HAVE SEEN THESE BEFORE NOW HERE ARE OLD FAVORITE AND NEW ONES TOO. GREAT FOR THAT AFTERNOON HOBBY.

FM MINI MIKE

A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.

FM-3 Kit **$14.95**
FM-3 Wired and Tested **29.95**

Color Organ

See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110 VAC.

Complete kit, ML-1 **$8.95**

Video Modulator Kit

Converts any TV to video monitor. Super stable, tunable over ch. 4-6. Runs on 5-15V, accepts std. video signal. Best unit on the market! Complete kit, VD-1 **$7.95**

Led Blinky Kit

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts. Complete kit, BL-1 **$2.95**

Super Sleuth

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker. Complete kit, BN-9 **$5.95**

CPO-1

Runs on 3-12 Vdc 1 watt out, 1 KHZ good for CPO, Alarm, Audio Oscillator. Complete kit **$2.95**

FM Wireless Mike Kit

Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 kit **$3.95** FM-2 kit **$4.95**

Whisper Light Kit

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC. Complete kit, WL-1 **$6.95**

Tone Decoder

A complete tone decoder on a single PC board. Features 400-5000 Hz adjustable range via 20 turn pot, voltage regulation. 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts. Complete kit, TD-1 **$5.95**

Universal Timer Kit

Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit **$5.95**

Mad Blaster Kit

Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC.

MB-1 Kit **$4.95**

Siren Kit

Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker. Complete kit, SM-3 **$2.95**

50 Hz Time Base

Runs on 5-15 VDC. Low current (2.5ma). 1 min./month accuracy. TB-7 Kit **$5.50** TB-7 Assy **$9.95**

CLOCK KITS

Your old favorites are here again. Over 7,000 Sold to Date. Be one of the gang and order yours today!

Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, black (specify).

Clock kit, 12/24 hour, DC-5 **$24.95**
Clock with 10 min. ID timer, 12/24 hour, DC-10 **$29.95**

For wired and tested clocks add $10.00 to kit price. SPECIFY 12 OR 24 HOUR FORMAT.

SATELLITE TV KIT

THE POPULAR SAT-TEC RECEIVER IN KIT-FO[RM]

SOLD OUT

image re[ject] fully tunable audio to recover hidde[n] loca[l] divide by two PLL demodulator for excellent threshold performance, tight [lo]cking to assure drift free reception, and of course, [24] channel tunable coverage.

[Sa]tellite TV system around the R2B, cl[ose] to a thousand others already have and now it's available in kit form at a new low price. Order you[rs] today.

NEW, LOWER PRICES!

Featured in a Radio Electronics magazine cover story (May 82), [Sat-tec] TV receiver is now operating in hundreds of locations. The R2B is easy to build; pre-etched, plated through [hole] board and component layout assure accurate component placement and the critical [RF] and local oscillator are pre-assembled and tuned! All parts are included for the [attractive] case, power supply, descriptive operating manual as well as complete assembly instructions. Features of the receiver include; dual conversion design for best

A complete Satellite TV System requires a dish antenna, LNA (low noise amplifier), Receiver and Modulator.

R2B Receiver Kit **$295.00**
R2B Receiver, Wired and Tested **$395.00**
120° K LNA **$295.00**
RM3 RF Modulator **$49.95**

Prices include domestic UPS shipping and insurance.

PARTS PARADE

IC SPECIALS

LINEAR

301	$ .35
324	$1.50
380	$1.50
555	$ .45
556	$1.00
565	$1.00
566	$1.00
567	$1.25
741	10/$2.00
1458	$ .50
3900	$ .50
3914	$2.95
8038	$2.95

CMOS

4011	.50
4013	.50
4046	$1.85
4049	.50
4059	$9.00
4511	$2.00
4518	$1.35
5639	$1.75

TTL

74S00	$ .40
7447	$ .65
7475	$ .50
7490	$ .50
74196	$1.35

SPECIAL

11C90	$15.00
10116	$ 1.25
7208	$17.50
7207A	$ 5.50
7216D	$21.00
7107C	$12.50
5314	$ 2.95
5375AB/G	$ 2.95
7001	$ 6.50

FERRITE BEADS

With info and specs **15/$1.00**
6 Hole Balun Beads **5/$1.00**

READOUTS

FND 359 .4" C.C.	$1.00
FND 507/510 .5" C.A.	1.00
MAN 72/HP7730 .33" C.A.	1.00
HP 7651 .43" C.A.	2.00

TRANSISTORS

2N3904 NPN C+F	15/$1.00
2N3906 PNP C+F	15/$1.00
2N4403 PNP C+F	15/$1.00
2N4410 NPN C+F	15/$1.00
2N4916 FET C+F	4/$1.00
2N5401 PNP C+F	5/$1.00
2N6028 C+F	4/$1.00
2N3771 NPN Silicon	$1.50
2N5179 UHF NPN	3/$2.00
Power Tab NPN 40W	3/$1.00
Power Tab PNP 40W	3/1.00
MPF 102/2N5484	$.50
NPN 3904 Type T+R	50/$2.50
PNP 3906 Type T+R	50/$2.50
2N3055	$.80
2N2646 UJT	3/$2.00

Sockets

8 Pin	10/$2.00
14 Pin	10/$2.00
16 Pin	10/$2.00
24 Pin	4/$2.00
28 Pin	4/$2.00
40 Pin	3/$2.00

Diodes

5.1 V Zener	20/$1.00
1N914 Type	50/$1.00
1KV 2Amp	8/$1.00
100V 1Amp	15/$1.00

25 AMP 100V Bridge **$1.50 each**

Mini-Bridge 50V 1 AMP 2 for $1.00

Resistor Ass't

Assortment of Popular values - ¼ watt. Cut lead for PC mounting. ½" center. ½" leads. bag of 300 or more. **$1.50**

Switches

Mini toggle SPDT **$1.00**
Red Pushbuttons N.O. **3/$1.00**

Earphones

3" leads. 8 ohm. good for small tone speakers, alarm clocks, etc. 5 for $1.00

Mini 8 ohm Speaker

Approx. 2¼" diam. Round type for radios, mike etc. **3 for $2.00**

Solid State Buzzers

small buzzer 450 Hz. 86 dB. sound output on 5-12 vdc at 10-30 mA. TTL compatible **$1.50**

Slug Tuned Coils

Small 3/16" Hex Slugs turned coil. 3 turns. 10 for $1.00

AC Outlet

Panel Mount with Leads **4/$1.00**

CAPACITORS

TANTALUM Dipped Epoxy	ALUMINUM Electrolytic		DISK CERAMIC	
1.5 uF 25V 3/$1.00	1000 uF 16V Radial	$.50	01 16V disk	20/$1.00
1.8 uF 25V 3/$1.00	500 uF 20V Axial	$.50	001 16V	20/$1.00
.22 uF 25V 3/$1.00	150 uF 16V Axial	5/$1.00	100 pF	20/$1.00
	10 uF 15V Radial	10/$1.00	047 16V	20/$1.00

DC-DC Converter

+5 vdc input prod. -9 vdc @ 30ma
+9 vdc produces -15 vdc @ 35ma **$1.25**

Ceramic IF Filters

Mini [SOLD OUT] ? kHz
B.W. [SOLD OUT] $1.50 ea.

25K 20 Turn Trim Pot **$1.00**
1K 20 Turn Trim Pot **$ .50**

Trimmer Caps

Sprague - 3-40 pf Stable Polypropylene **.50 ea.**

Crystal Microphone

Small 1" diameter ¼" thick crystal mike cartridge **$.75**

Mini RG-174 Coax **10 ft. for $1.00**

Coax Connector

Chassis mount BNC type **$1.00**

9 Volt Battery Clips

Nice quality clips **5 for $1.00**
⅜" Rubber Grommets **10 for $1.00**

Parts Bag

Asst of chokes, disc caps, tant. resistors, transistors, diodes, MICA caps etc. sm. bag (100 pc) **$1.00** lg. bag (300 pc) **$2.50**

Connectors

6 pin type gold contacts for mA-1003 car clock module price **.75 ea.**

Leds - your choice, please specify

Mini Red, Jumbo Red, High Intensity Red, Illuminator Red **8/$1**
Mini Yellow, Jumbo Yellow, Jumbo Green **6/$1**

Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range - **.50 each or 3/$1.00**

Audio Prescaler

Make high resolution audio measurements, great for musical instrument tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives .01 HZ resolution with 1 sec. gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS.

PS-2 kit **$ 39.95**
PS-2 wired **$ 49.95**

600 MHz PRESCALER

Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity. specify - 10 or -100

Wired, tested, PS-1B **$59.95**
Kit, PS-1B **$44.95**

30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 30 W pwr amp kit **$ 24.95**
TR-1, RF sensed T-R relay kit **6.95**

MRF-238 transistor as used in PA-1 8-10db gain 150 mhz **$11.95**

Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and +5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3 V @ 1 A and 24 VCT. Complete kit, PS-3LT **$6.95**

RF actuated relay senses RF (1W) and closes DPDT relay. For RF sensed T-R relay TR-1 Kit **$6.95**

OP-AMP Special

BI-FET LF 13741 - Direct pin for pin 741 [SOLD OUT] but 500,000 MEG input z, super low 50 pa input curr[ent] power drain.

50 for only $9.00 **10 for $2.00**

Regulators

78MG	$1.25	7812	$1.00
79MG	$1.25	7815	$1.00
723	$.50	7905	$1.25
309K	$1.15	7912	$1.25
7805	$1.00	7915	$1.25

Shrink Tubing Nubs

Nice precut pces of shrink size 1" x ¼" shrink to ¼". Great for splices. **50/$1.00**

Mini TO-92 Heat Sinks

Thermalloy Brand **5 for $1.00**
To-220 Heat Sinks **3 for $1.00**

Opto Isolators - 4N28 type **$.50 ea.**
Opto Reflectors - Photo diode + LED **$1.00 ea.**

Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. **20 strips for $1.00**

CDS Photocells

Resistance varies with light, 250 ohms to over 3 meg **3 for $1.00**

See List of Advertisers on page 98

THE MOST AFFORDABLE REPEATER

ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

JUST LOOK AT THESE PRICES!

Band	Kit	Wired/Tested
10M,6M,2M,220	$680	$880
440	$780	$980

Both kit and wired units are complete with all parts, modules, hardware, and crystals.

CALL OR WRITE FOR COMPLETE DETAILS.

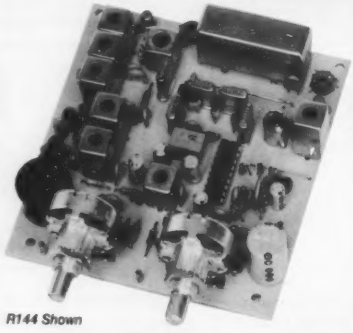
Also available for remote site linking, crossband, and remote base.

FEATURES:

- SENSITIVITY SECOND TO NONE; TYPICALLY 0.15 uV ON VHF, 0.3 uV ON UHF.
- SELECTIVITY THAT CAN'T BE BEAT! BOTH 8 POLE CRYSTAL FILTER & CERAMIC FILTER FOR GREATER THAN 100 dB AT ± 12KHZ. HELICAL RESONATOR FRONT ENDS. SEE R144, R220, AND R451 SPECS IN RECEIVER AD BELOW.
- OTHER GREAT RECEIVER FEATURES: FLUTTER-PROOF SQUELCH, AFC TO COMPENSATE FOR OFF-FREQ TRANSMITTERS, SEPARATE LOCAL SPEAKER AMPLIFIER & CONTROL.
- CLEAN, EASY TUNE TRANSMITTER; UP TO 20 WATTS OUT (UP TO 50W WITH OPTIONAL PA).

HIGH QUALITY MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.

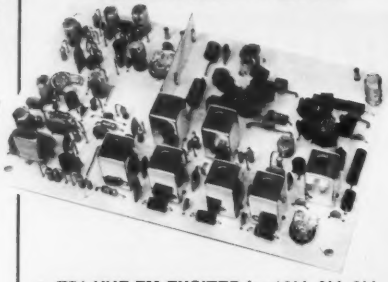
HIGH-PERFORMANCE RECEIVER MODULES



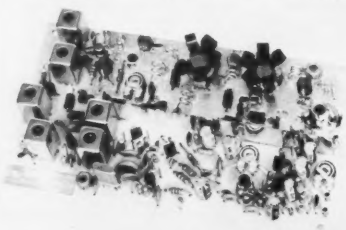
R144 Shown

- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.; 8 pole xtal filter & ceramic filter in i-f, helical resonator front end for exceptional selectivity, more than −100 dB at ±12 kHz, best available today. Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit only $138.
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $138.
- **R76 FM RCVR** for 10M, 6M, 2M, 220, or commercial bands. As above, but w/o AFC or hel. res. Kits only $118.
  Also avail w/4 pole filter, only $98/kit.
- **R110 VHF AM RECEIVER** kit for VHF aircraft band or ham bands. Only $98.
- **R110-259 SPACE SHUTTLE RECEIVER,** kit only $98.

TRANSMITTERS

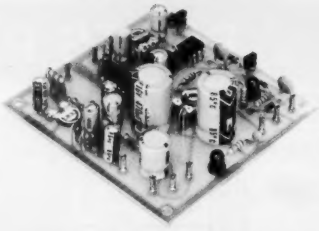


- **T51 VHF FM EXCITER** for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous, up to 2½ W intermittent. $68/kit.

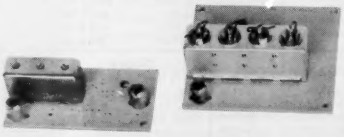


- **T451 UHF FM EXCITER** 2 to 3 Watts on 450 ham band or adjacent freq. Kit only $78.
- **VHF & UHF LINEAR AMPLIFIERS.** Use on either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Several models. Kits from $78.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 x 8 x 2 inches. Designed especially for repeaters. $20.

ACCESSORIES



- **COR KITS** With Audio mixer, speaker amplifier, tail & time out timers. Kit only $38.
- **CWID KITS** 158 bits, field programmable, clean audio, rugged TTL logic. Kit only $68.
- **DTMF DECODER/CONTROLLER KITS.** Control 2 separate on/off functions with touchtones®, e.g., repeater and autopatch. Use with main or aux. receiver or with Autopatch. Only $90
- **AUTOPATCH KITS.** Provide repeater autopatch, reverse patch, phone line remote control of repeater, secondary control via repeater receiver. Many other features. Only $90. Requires DTMF Module.

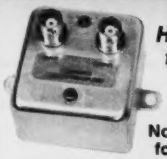


- **HELICAL RESONATOR FILTERS** available separately on pcb w/connectors.

HRF-144 for 143-150 MHz	$38
HRF-220 for 213-233 MHz	$38
HRF-432 for 420-450 MHz	$48

hamtronics® 33

NEW LOW-NOISE PREAMPS RECEIVING CONVERTERS TRANSMIT CONVERTERS



Hamtronics Breaks the Price Barrier!

*

No Need to Pay $80 to $125 for a GaAs FET Preamp.

FEATURES:

- Very Low Noise: 0.7 dB VHF, 0.8 dB UHF
- High Gain: 18 to 28 dB, Depending on Freq.
- Wide Dynamic Range for Overload Resistance
- Latest Dual-gate GaAs FET, Stable Over Wide Range of Conditions
- Rugged, Diode-protected Transistors
- Easy to Tune
- Operates on Standard 12 to 14 Vdc Supply
- Can be Tower Mounted

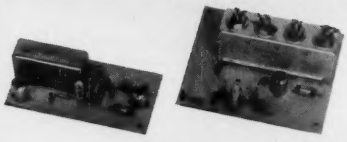
MODEL	TUNES RANGE	PRICE
LNG-28	26-30 MHz	$49
LNG-50	46-56 MHz	$49
LNG-144	137-150 MHz	$49
LNG-220	210-230 MHz	$49
LNG-432	400-470 MHz	$49
LNG-40	30-46 MHz	$64
LNG-160	150-172 MHz	$64

ECONOMY PREAMPS

Our traditional preamps, proven in years of service. Over 20,000 in use throughout the world. Tuneable over narrow range. Specify exact freq. band needed. Gain 16-20 dB. NF = 2 dB or less. VHF units available 27 to 300 MHz. UHF units available 300 to 650 MHz.

- P30K, VHF Kit less case $18
- P30W, VHF Wired/Tested $33
- P432K, UHF Kit less case $21
- P432W, UHF Wired/Tested $36

HELICAL RESONATOR PREAMPS



Our lab has developed a new line of low-noise receiver preamps with helical resonator filters built in. The combination of a low noise amplifier and the sharp selectivity of a 3 or 4 section helical resonator provides increased sensitivity while reducing intermod and cross-band interference in critical applications. See selectivity curves at right. Gain = approx. 12 dB.

Model	Tuning Range	Price
HRA-144	143-150 MHz	$49
HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$59
HRA-( )	150-174MHz	$69
HRA-( )	450-470 MHz	$79

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

	Antenna Input Range	Receiver Output
VHF MODELS	28-32	144-148
	50-52	28-30
Kit with Case $49	50-54	144-148
Less Case $39	144-146	28-30
Wired $69	145-147	28-30
	144-144.4	27-27.4
	146-148	28-30
	144-148	50-54
	220-222	28-30
	220-224	144-148
	222-226	144-148
	220-224	50-54
	222-224	28-30
UHF MODELS	432-434	28-30
	435-437	28-30
Kit with Case $59	432-436	144-148
Less Case $49	432-436	50-54
Wired $75	439.25	61.25

SCANNER CONVERTERS Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $88.

SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

FM-5 PC Board Kit – **ONLY $178** complete with controls, heatsink, etc. 10 Watts, 5 Channels, for 2M or 220 MHz.

Cabinet Kit, complete with speaker, knobs, connectors, hardware. Only $60.

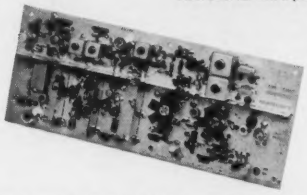
REPEAT OF A SELLOUT!

While supply lasts, get $60 cabinet kit free when you buy an FM-5 Transceiver kit. Where else can you get a complete transceiver for only $178

For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

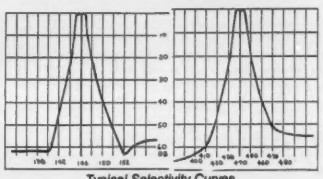
	Exciter Input Range	Antenna Output
For VHF,	28-30	144-146
Model XV2	28-29	145-146
Kit $79	28-30	50-52
Wired $149	27-27.4	144-144.4
(Specify band)	28-30	220-222*
	50-54	220-224
	144-146	50-52
	50-54	144-148
	144-146	28-30
For UHF,	28-30	432-434
Model XV4	28-30	435-437
Kit $99	50-54	432-436
Wired $169	61.25	439.25
	144-148	432-436*

*Add $20 for 2M input



VHF & UHF LINEAR AMPLIFIERS. Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

LOOK AT THESE ATTRACTIVE CURVES!



Typical Selectivity Curves of Receivers and Helical Resonators.

IMPORTANT REASONS WHY YOU SHOULD BUY FROM THE VALUE LEADER:

1. *Largest selection of vhf and uhf kits in the world.*
2. *Exceptional quality and low prices due to large volume.*
3. *Fast delivery; most kits shipped same day.*
4. *Complete, professional instruction manuals.*
5. *Prompt factory service available and free phone consultation.*
6. *In business 21 years.*
7. *Sell more repeater modules than all other mfrs. and have for years. Can give quality features for much lower cost.*

- **Call or Write for FREE CATALOG**
- (Send $1.00 or 4 IRC's for overseas mailing)
- Order by phone or mail ● Add $3 S & H per order
(Electronic answering service evenings & weekends)
Use VISA, MASTERCARD, Check, or UPS COD.

hamtronics, inc.

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Phone: 716-392-9430

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See List of Advertisers on page 98

DEALER DIRECTORY

Culver City CA

Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003. Trades 463-1886 San Diego, 827-5732 (Reno NV).

Fontana CA

Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. **Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.**

San Jose CA

Bay area's newest amateur radio store. New & used amateur radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santec & many more. **Shaver Radio, Inc., 1775A S. Winchester Blvd., Campbell CA 95008, 370-6665.**

New Castle DE

Factory Authorized Dealer! Yaesu, ICOM, Ten-Tec, KDK, Azden, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **Delaware Amateur Supply, 71 Meadow Road, New Castle DE 19720, 328-7728.**

Boise ID

Rocky Mountain area's newest ham dealer. Call RJM first for AEA, Azden, KDK, Ten-Tec, Butternut, Cushcraft, and more! **RJM Electronics, 4204 Overland, Boise ID 83705. 343-4018.**

Preston ID

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. **Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.**

Littleton MA

The reliable ham store serving NE. Full line of ICOM & Kenwood. Yaesu HTs, Drake, Daiwa, B&W accessories. Curtis & Trac keyers. Larsen, Hustler, Telex/Hy-Gain products. Mirage amps., Astron P.S., Alpha Delta protectors, ARRL & Kantronics instruction aids. Whistler radar detectors. Full line of coax fittings. **TEL—COM Electronic Communications, 675 Great Rd. (Rt. 119), Littleton MA 01460, 486-3400/3040.**

Ann Arbor MI

See us for products like Ten-Tec, R. L. Drake, DenTron and many more. Open Monday through Saturday, 0830 to 1730. WB8VGR, WB8UXO, WD8OKN, and W8RP behind the counter. **Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor MI 48104, 668-8696.**

Livonia MI

Complete photovoltaic systems. Amateur radio, repeater, satellite, and computer applications! Call Paul WD8AHO. **Encon Photovoltaics, 27600 Schoolcraft Road, Livonia MI 48150, 523-1850.**

Hudson NH

Look!—hams, SWLs, and experimenters: parts, books, gear, antennas, towers. Call for quotes. **Polcari's ELECTRONICS CENTER, 61 Lowell Road (Route 3A), Hudson NH 03051, 883-5005.**

Albany, New York UPSTATE NEW YORK

Kenwood, ICOM, Ten-Tec, Belden, Cushcraft, Larsen, Hustler, ARRL, Hy-Gain, B&W, MFJ, Mirage. New and used equipment. Serving the amateur community since 1942. **Adirondack Electronics, Inc., 1991 Central Avenue, Albany NY 12205, 456-0203** (one mile west of Northway exit 2W).

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The biggest and best ham store in the Midwest featuring Kenwood and other quality products with working displays. We sell only the best. Authorized Kenwood service. **Universal Amateur Radio, Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.**

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IBM PC/XT kits, supplies, expansion products; video restorer kits for pay TV, CATV, satellite hobbyists' electronic project kits/app-notes. More than 9000 parts in stock: semiconductors, ICs, discretes, video accessories, tools, audio, automotive, cabinets, computer peripherals. Please write for your free 60-page catalog: **Sabet Electronics, 13650 Floyd Rd., Ste. 104, Dallas TX 75243; 783-4950 (formerly I.E.).**

DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the October '84 issue must be in our hands by August 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U. S. S. R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

July

SUN	MON	TUE	WED	THU	FRI	SAT
1 G/G	2 F/G	3 G/G	4 G/G	5 F/F	6 F/G	7 F/G
8 F/F	9 F/F	10 F/G	11 F/G	12 F/G	13 G/G	14 G/G
15 G/G	16 F/G	17 P/F	18 F/F	19 G/G	20 G/G	21 G/G
22 F/F	23 P/P	24 P/F	25 F/F	26 G/G	27 G/G	28 G/G
29 G/G	30 G/G	31 F/G				

THE NEW LOOK AT YAESU

Tired of paying too much for your Ham gear? The new generation of Yaesu high-technology equipment is designed with you in mind! New advances in computer-aided design and robotics manufacture help you save money while being assured of the best... from Yaesu!!!

FT-757GX Line

Affordable Excellence

GENERAL COVERAGE
Continuous coverage on RX from 500 kHz to 29.99 MHz in 10 Hz steps, with easy modification for MARS TX outside the Ham bands. WARC bands factory installed.

ACCESSORIES FACTORY PACKED
Electronic keyer, 600 Hz CW filter, speech processor, AM and FM units, all-mode squelch, Woodpecker noise blanker, and receiver preamp ... all included in the base price, not expensive options!

FULL PERFORMANCE
Full CW QSK, full 100 watts output at 100% duty cycle (SSB/CW/FM), and full microprocessor control with dual VFOs, eight memories with bilateral memory/VFO swap, and personal computer (CAT System) compatibility make the FT-757GX a winner, at home or away.

FT-757GX ACCESSORIES
FP-757GX Switching Power Supply, FP-757HD Heavy Duty Power Supply (for 100% duty cycle operation), FC-757AT Automatic Antenna Tuner with Memory, FAS-1-4R Remote Antenna Selector, SP-102 Speaker with Audio Filters, MD-188 Desk Mic, MH-1B8 Hand Mic, FIF-232C Computer Interface Module.

FT-203R Line

The Compact Companion

ULTRA-COMPACT DESIGN
Chip components installed by Yaesu's assembly robots significantly reduce circuit board size, resulting in a rugged, reliable transceiver with a weight of only 450g, including the standard FNB-3 battery.

HANDS-FREE VOX
A VOX (voice-actuated transmit) unit is built-in, allowing hands-free operation when the optional YH-2 Headset is used. Ideal for tower work, public safety, or other applications where manual PTT control is inadvisable. Level control provided.

FULL FLEXIBILITY
Built-in S-meter, thumbwheel frequency programming, HI/LOW power switch, busy channel and transmit indicators are standard. DTMF Encoder versions, as well as 220 MHz and 440 MHz lines, are coming soon!

FT-203R ACCESSORIES
FTS-7 CTCSS Module, FBA-5 AA Cell Case, YH-2 Headset, MH-12 Speaker/Mic, FNB-4 High-Capacity Battery, PA-3 Mobile Adapter, MMB-21 Mobile Hanger, NC-15 Quick Charger/AC Adapter, FTT-3 DTMF Keypad.

Next time you're in the market for a better rig, ask about Yaesu. Designed with care and built with pride, your Yaesu will get you through!

Prices and specifications subject to change without notice or obligation.

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YAESU CINCINNATI SERVICE CENTER 9070 Gold Park Drive, Hamilton, OH 45011 (513) 874-3100

KENWOOD

...pacesetter in amateur radio

Scan the World.

R-2000

Kenwood's R-2000 receiver has opened the doors to a new world in the 150-kHz to 30-MHz HF bands, with microprocessor controlled operating features and an UP conversion PLL circuit for maximum flexibility and to enhance the excitement of listening to stations from east to west, and from pole to pole. An optional VC-10 VHF converter, for 118 to 174-MHz, allows access to police, aviation, marine, commercial, and two meter Amateur frequencies. With dual digital VFO's, ten memories that store frequency, band and mode information, memory scan, programmable band scan, fluorescent tube digital display, and dual 24-hour clock with timer, this outstanding radio has the versatility needed to reach out and catch those distant and elusive stations in the most remote areas of the world.

The R-2000 receives in the USB, LSB, CW, AM, and FM modes, and its ten memories allow moving from band to band without concern for mode of operation. The programmable band scan feature permits scanning over operator selected limits, reducing scan cycle time. Memory scan allows the operator to scan all, or only specific memories. Lithium battery memory backup (Estimated 5 year life) is built-in.

With the sensitive R-2000, only the best in selectivity will do. It has three built-in IF filters, with NARROW/WIDE selector switch, and an optional 500-Hz narrow CW filter is available. A noise blanker, and an all-mode squelch circuit further enhance the operators control of his listening environment. An AGC switch, and an RF attenuator switch allow selection of the best signal-to-noise ratio. It has a large, front mounted speaker, a tone control, an "S" meter, high and low impedance antenna terminals, and operates on 100/120/220/240 VAC, or on 13.8 VDC, with an optional DCK-1 DC cable kit. Other features include a record output jack, an audible "beeper," a carrying handle, a headphone jack, and an external speaker jack.

The R-2000 places the world at your finger tips.

R-2000 optional accessories: VC-10 VHF converter • HS-4, HS-5, and HS-6 headphones • DCK-1 DC cable kit • YG-455C 500-Hz CW filter.

R-1000 High performance receiver • 200 kHz—30 MHz • digital display/clock/timer • 3 IF filters • PLL UP conversion • noise blanker • RF step attenuator • 120-240 VAC (Optional 13.8 VDC).

R-600 General coverage receiver • 150 kHz—30 MHz • digital display • 2 IF filters • PLL UP conversion • noise blanker • RF attenuator • front speaker • 100-240 VAC (Optional 13.8 VDC).

More information on these products is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

Specifications and prices are subject to change without notice or obligation.